TECHNOLOGY DEPT.

AMERICAN MACHINIST

FEBRUARY 3, 1944

Conveyors Help Build Bombsights on Schedule—Page 105

Precision in Wartime — Finishing diesel engine pistons for battleships

In 1944

LET'S WORK FOR VICTORY

Only reconversion planning NOW can avert the widespread unemployment otherwise inevitable in the period between cessation of war production and resumption of peacetime production. Not that we have won the war, we haven't, and a long, desperate battle lies ahead. Even so, every bit of postwar planning done now will help in far greater ratio, when V-Day comes, to provide for the stricken people of a ravaged world, in putting our demobilized soldiers and war workers back to work on useful jobs.

If your postwar plans include precision finishing, HEALD ENGINEERING is available, now. Long and varied experience in solving countless problems in precision boring and grinding in consumer and heavy industries, plus our undiminished present efforts in war production, can be immensely helpful. We'll be glad to work with you.

But Plan For Peace

THE HEALD MACHINE CO., Worcester, Mass.

Postwar precision operations will include Heald Bore-Matics like this for facing automotive flywheels.

In 194V the most tremendous shortage of goods this world has ever known must be satisfied — by you and your competitors. Planning now for postwar production will eliminate many bottlenecks later — and if problems involve precision Heald will gladly cooperate in their solution. Although our staff of 250 engineers are engaged on war problems, their experience in finishing peacetime products from automobiles to sewing machines is also available to help in your postwar planning.

In 1944

for More Precision Faster, bring your problem to Heald

TECHNOLOGY DEPT.

American Machinist

February 3, 1944

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McGRAW-HILL PUBLISHING COMPANY, 330 West 42 Street, New York 18, N. Y.
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From _____

_____

To _____

_____

Signed _____

AMERICAN MACHINIST —chips

New Invention . . . To put it mildly, we were somewhat startled by the Prince Albert ad (see below) recently clipped from a newspaper comic section. Apparently, this started out to be an automatic screw machine but when we saw the size of the machine in comparison to the people, and noticed what appear to be washers shooting out of the stock support tubes, we were stopped. We think our shop friends will get a chuckle out of this, and who knows—perhaps a design idea!

✪

Old Timer . . . *Mr. F. A. Errington, head of Errington Mechanical Laboratory of Staten Island, New York, is not one to do things halfway. Advising us that he expects to continue his advertising in* American Machinist *for 1944, he adds: "We have had the habit for the past 50 years or more and believe it is a good one" ! ! !*

It Can Be Done . . . As we get rolling on this new year of aggressive optimism, it might be in order to cast our eyes backward 65 years at a prediction challenging America's ability to do the "impossible." *American Machinist* of January, 1879, reported as follows: . . . "The East River Bridge a Failure"—*Every Saturday* says: "Notwithstanding an expenditure of nearly $13,500,000, the great East River Bridge between Brooklyn and New York will undoubtedly be abandoned. Mr. William H. Webb, an engineer, states that the bridge is wholly incapacitated to facilitate either passengers or business traffic; that it is insecure and cannot withstand the violent storms it will be subjected to; that it will not bear the enormous weights that may be expected; and that the cost and delay in taking down and replacing the top masts of vessels necessary to all that pass under the bridge, cannot be tolerated. . . ."

Yes . . . and there were many who doubted that Metal-Working could arm the United Nations in a few short years. Never know till you try.

✪

Machine Tool Distributors . . . *Fresh off the press is* American Machinist's *revised "Directory of American Machine Tool Distributors." This was last compiled in 1941 and a number of changes have been made. The Directory gives locations, offices, territories and companies represented by distributors. A very useful guide to help you find new sources of supply. Available upon request at no charge—just drop us a line.*

✪

Booklet Review . . . Recently come to hand are several pieces of literature in which most Metal-Working men should be interested:

Allis-Chalmers new "Operation and Maintenance Review." 24 pages, *Reader's Digest* style, packed with readable and practical ideas on plant equipment maintenance.

The National Association of Manufacturers' 20-page booklet "Testimony to the Future"—a thought-stimulating report of what's going on in post-war industrial research.

MONSTER "GUN"
SHOOTS AT AXIS THOUSANDS OF MILES FROM FRONT
THIS MECHANISM IS ACTUALLY A POWERFUL WEAPON, THOUGH YOU SEE IT AT WORK IN A WAR PLANT
YOU MEAN IT SHOOTS PROJECTILES?
NO, IT SHOOTS OUT VITAL PARTS FOR WAR MATERIAL. METAL RODS ARE FED INTO THE BREECHES, CUT INTO PIECES, THEN DRILLED AND THREADED. IT'S COMPLETELY AUTOMATIC
THESE ARE FINISHED PARTS READY FOR ASSEMBLY INTO BATTLE EQUIPMENT
THAT'S PERFECTLY AMAZING! WELL, IT'S ONE WAY TO HURRY THE DAY OF PEACE
AT LEAST WE DON'T HAVE TO WAIT FOR PEACE TO OUR TONGUES, EH, CAPTAIN? PRINCE ALBERT SURELY IS THE BITE-FREE SMOKE!
P.A.'S MILDNESS WITH RICH TASTE IS WHAT MEN WANT IN 'MAKIN'S' SMOKES, TOO— AND THE CRIMP CUT IS A PRIZE FOR EASY ROLLING
50 PIPEFULS OF FRAGRANT TOBACCO IN EVERY HANDY POCKET PACKAGE OF PRINCE ALBERT
70 FINE ROLL-YOUR-OWN CIGARETTES IN EVERY HANDY POCKET PACKAGE OF PRINCE ALBERT
PRINCE ALBERT
THE NATIONAL JOY SMOKE
BUY WAR BONDS AND STAMPS

BEVEL GEAR DRIVES — TO Victory

THIS IS A WAR OF MOTION

Unlike World War I which was characterized by static trench warfare, this is truly a war of ***motion*** in which victories are won by the army which can mass the most men and equipment in the shortest time to strike against critical objectives. In this war of lightning-like maneuvers the army with the superior mechanized equipment naturally has the advantage.

A typically American innovation developed by U. S. Army Ordnance for this type of warfare is the "jeep". Although unimpressive in appearance, this tough little "jeep" has proven its worth by providing Allied forces with superior flexibility of striking power . . . transporting small troop units over the rugged, mountainous terrain in Italy or fording shallow streams in the jungles of New Guinea . . . hauling equipment in the damp cold of Attu, over the hot sands of the Sahara or the muddy beaches of Bougainville. In this manner the versatile "jeep" has been invaluable to all branches of the service, whether Army, Marine Corps, Signal Corps or Red Cross.

HYPOID GEARS PROVIDE THE HIGH-SPEED, DURABLE POWER TRANSMISSION REQUIRED

These extreme conditions are most exacting in the demands they place on the gears used to transmit the driving power from the "jeep's" sturdy engine to its front and rear wheels. Hypoids have successfully met the test by supplying in a small space a smooth flow of power without danger of failure at a wide range of speeds and loads, under split-second starts and abrupt stops.

CUT ON GLEASON MACHINES

These hypoid gears are being cut with great accuracy at high production rates in the plants of leading automotive companies. The pinions are cut on the No. 16 Pinion Machines and the gears on the No. 11 Gear Machines.

Accepted before the war, proven in actual combat, hypoids produced on Gleason machines will transmit smooth, quiet, high-speed power for the automobile of tomorrow.

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

DIAL TYPE DUAL CONTROLS ... ASSURE COMPLETE VISIBILITY FROM *ANY POSITION*

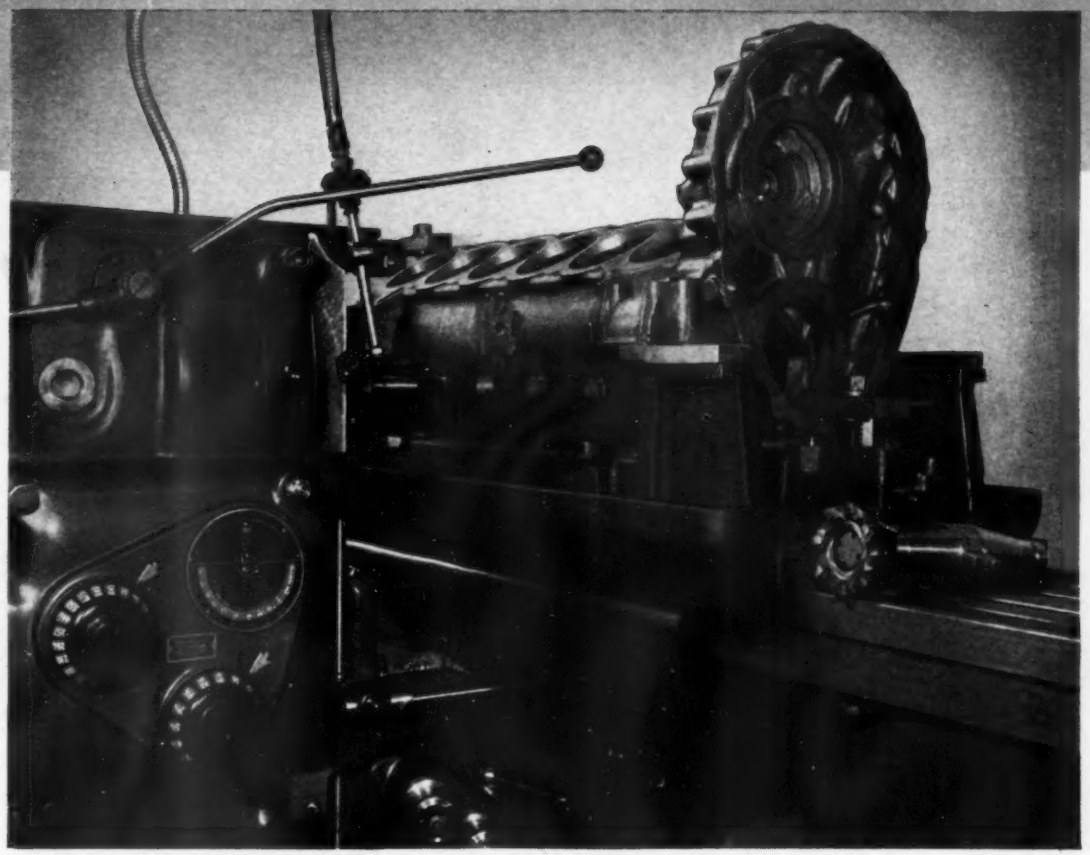
Illustrated at the left is the CINCINNATI No. 3 Plain High Speed Dial Type Miller. These machines are available in Plain, Universal and Vertical Styles, Nos. 2, 3 and 4 sizes, Medium and High Speed ranges. Catalog M-970-2 contains complete information and specifications. Sweet's Catalog File for Mechanical Industries gives a brief description of Dial Type Milling Machines.

CINCINNATI

Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded February 23, 1943, and the third star September 27, 1943.

THE CINCINNATI M

MILLING MACHINE



The illustration above shows clearly the absolute necessity of dual controls to assure maximum visibility and complete manipulation from the rear working position. Imagine how difficult it would be to handle the milling operation on this crankcase without them. ¶ The operation consists of rough and finish milling the bolt boses and oil pump pad. The work piece is held in position by a special hand-clamping fixture, and by employing cutters mounted on quick-change extension arbors, the two surfaces are milled in one loading of the work. This set-up (on a standard machine without an overarm) demonstrates the practicability of milling unusual jobs on the Dial Types and bears out our contention that you just can't beat these versatile millers for handling a wide range of work. ¶ In addition to complete dual controls, CINCINNATI Dial Types offer many advantages. For example: Power Speed and Feed Changes. High Spindle Speeds and Feeds. Touch Control Starting and Stopping. Pull-Out, Quick-Adjusting Micrometer Dials. Built-In Speed Calculator. Single Piece Overarm Brace, clamping to top of knee. Automatic Motor Cut-Out Switch, and many others you'll be interested in knowing about. ¶ The engineers here at Milling Headquarters will be glad to discuss your milling problems with you.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

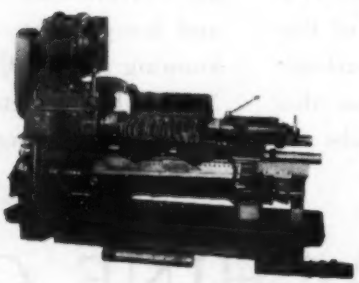
did you ever see a DREAM flying?

In great grandfather's day some unknown illustrator of dime novels . . . some minor Jules Verne . . . dreamed and made a picture of this contraption. Although striking in its resemblance to our present day helicopter, it flew only in his imagination.

But imagination was not enough. Before dreamers could join the birds, their ideas had to be put into production.

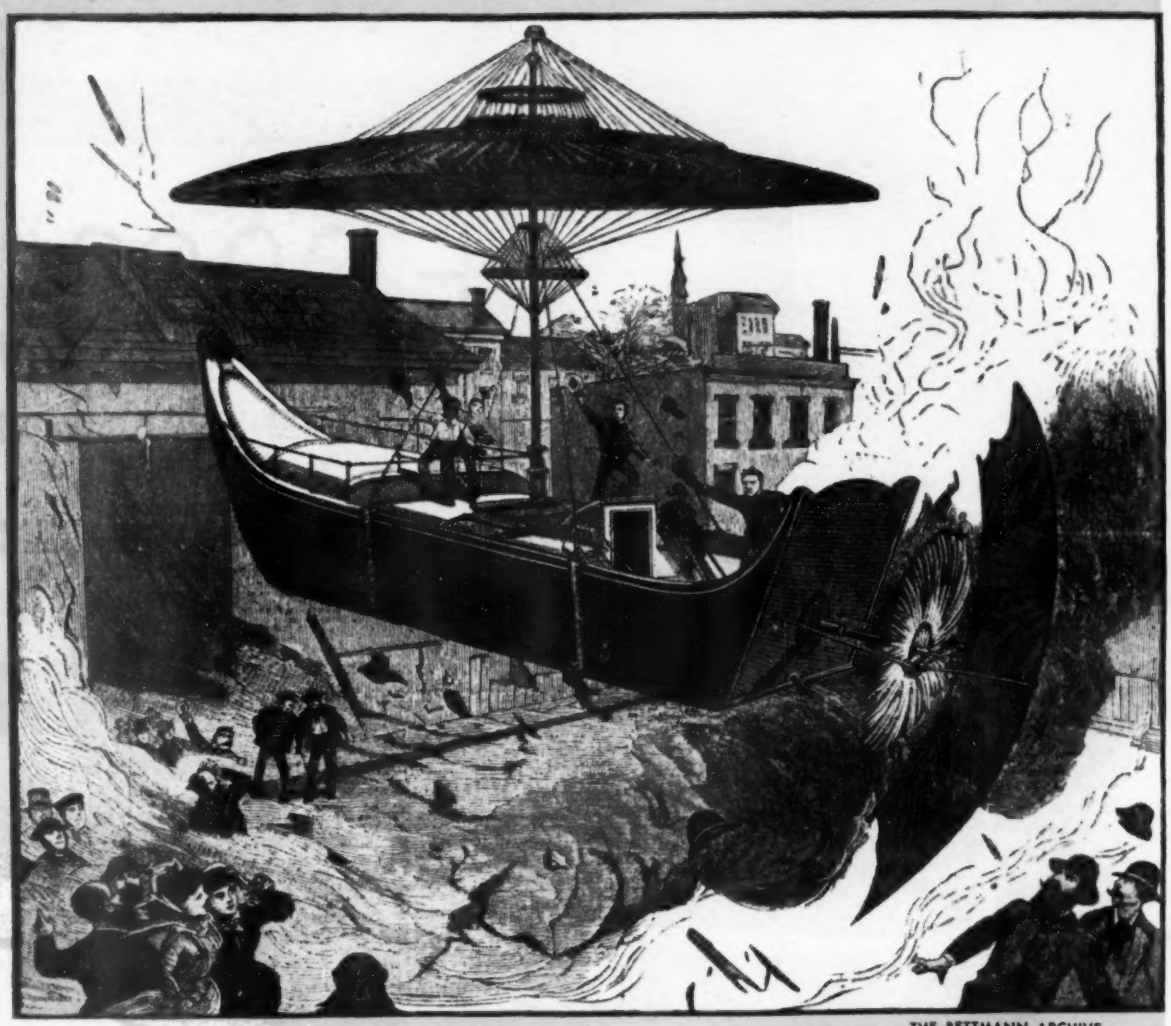
Men are still dreaming of flight . . . of flying faster, farther, higher . . . of carrying greater loads and carrying them cheaper . . . of putting more aircraft into the service of more people. And working with them, helping to ready their ideas for practical, economical production, are the makers of Jones & Lamson machine tools.

They are at your service too, ready to help you with your wartime problems or your post-war plans.



Jones & Lamson Fay Automatic Lathe for machining landing gear strut cylinders

Jones & Lamson Fay Automatic Lathes are used throughout the aircraft industry —from the machining of the engines that deliver the power-punch to victorious American war planes—to the landing gear that cushions their return to earth. As time goes on, even mightier craft will fly our airways and we, at Jones & Lamson, will be ready with the tools and service to be used in their production.

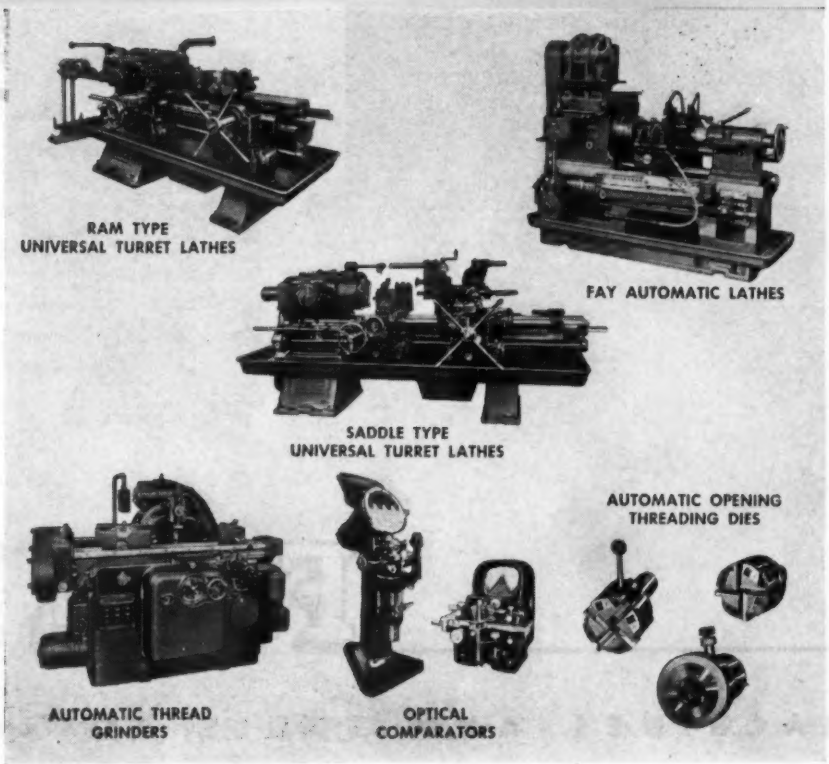


THE BETTMANN ARCHIVE

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

PROFIT-PRODUCING MACHINE TOOLS



±.0002"

TOLERANCE IN SMALL GEARS

UNDER PRECISION

Easy-reading Dial Setting Calibrations
Simplify Depth Feed Control

Rotating under pressure engagement with the work, the Fellows Shaving Tool produces concentric gear teeth. Since the sizing of a gear to tenths of a thousandth — for zero blacklash assembly — is a function of the depth feed mechanism, provision is made for precision control without special instruments or gages. The calibrated dial indicated above advances the depth feed a mere .0005 inch for each 1/16 inch graduation.

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTIO

Magnified from an actual area like this [●], these tiny chips from the Fellows Fine-Pitch Gear Shaving Machine represent the controlled result from a machining operation which is almost miraculous in its precision. Gear Teeth are finished accurate as to shape and concentricity.

CONTROL . . . .

In many instances, specifications now call for gears of accuracy beyond precedent, particularly where mechanical motion must be transferred within narrow tolerance limits. When faced with this problem, the manufacturer will find the Fellows No. 4 Fine-Pitch Gear Shaving Machine the ready answer. This shaving machine can handle external spur and helical gears from 4 inches down to ⅛ inch pitch diameter —sizes found in instruments of all types, and in a wide variety of electronic devices.

This precision tool is capable of continuously-accurate and highly-economical production. When set for a production run, identical gears are turned out at a high rate of speed. With this precision, *zero backlash* gears can be obtained on a commercial basis.

For details write for more fully descriptive bulletin: The Fellows Gear Shaper Company, Springfield, Vermont — or 616 Fisher Building, Detroit 2, Michigan, or 640 West Town Office Building, Chicago 12, Illinois.

Method

. . . . FROM BLANK TO FINISHED GEAR

This machine has

you need in a toolroom

The CINCINNATI Hydraulic Universal Grinding Machine meets all the requirements for toolroom and general manufacturing work. This machine will handle External grinding, Internal grinding and Face grinding on a wide range of work. One of its unusual advantages is the Internal Grinding Attachment which is driven by an Independent Motor and permanently affixed to the machine. ¶ CINCINNATI Hydraulic Universals give you Quick Set-up, Extreme Accuracy, Fine Finishes, Foolproof Operation and Low Cost Maintenance over a long period of time. Then, too, you'll find them easy to operate; the kind of machines your shop men will like. Complete information may be obtained by writing for illustrated catalog. For a brief description, look in Sweet's Catalog File for Mechanical Industries.

CINCINNATI Hydraulic Universal Grinding Machines are available in 12", 14", 16" and 18" swings; and 36", 48" and 72" between-center lengths. Complete information is contained in catalog G-486-1 for the 12" machine, and G-474-1 for the 14", 16" and 18" machines.

Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded February 23, 1943, and the third star September 27, 1943.

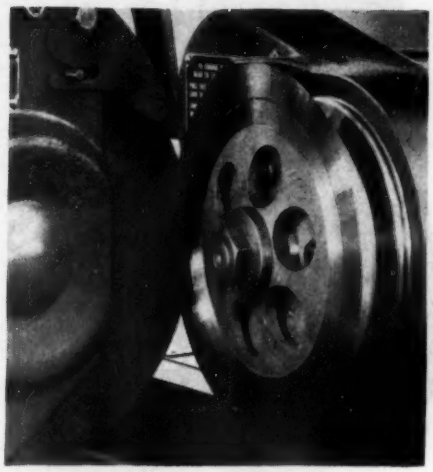
CINCINNATI

CENTER TYPE GRINDING MACHINES

s everything
m grinder!

Above: An External job. Grinding the taper—3½" per foot—on the shank end of an attachment driving gear. Notice the Internal Grinding Attachment on the front of the wheelhead. The attachment is up and out of the way but ready for instant use.

CINCINNATI



Above: An Internal job. Here the Internal Grinding Attachment has been pulled down into position for grinding the bore in a short shaft to an accurate plug-gage fit. The attachment is standard equipment always in place and may be set up at a moment's notice. ¶ Right: a Face grinding job. All three types of grinding are handled quickly, easily, accurately on the CINCINNATI Hydraulic Universal.

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

VAN NORMAN

GIVES YOU THESE DISTINC

APPLICATIONS:

- HARDENING
- BRAZING
- SOLDERING
- ANNEALING
- MELTING
- AND OTHER SELECTIVE HEATING APPLICATIONS

HIGH FREQUENCY
INDUCTION HEATING EQUIPMENT
ADVANTAGES

UNIFORM HARDENING—Once the proper working coil and heating and quenching cycle of a particular work piece has been established, piece after piece is hardened with identical physical characteristics, as to the heat penetration and the depth of hardness.

POSITIVE RESULTS—Whether the Induct-O be used for hardening or annealing, brazing, soldering, etc., positive results will be obtained because the heating time, temperature, and depth of heat penetration is accurately and automatically controlled.

SAVES TIME—Because the heat is localized to a specific portion of a work piece, induction heating hardens or heats most metal parts in a matter of seconds as compared to hours when other methods such as furnaces, carburizing, etc., are used. Thus once the machine is set up for a particular job, the operator hardens piece after piece in a few seconds.

INCREASES OUTPUT—Because the entire heat-treating operation is automatic, practically no distortion or warping is encountered . . . scale is minimized . . . and chances of human error are eliminated. Add to this the fact that the heating operations are completed in seconds, and it is readily seen how output is increased.

EASY TO OPERATE—To perform any hardening, annealing, brazing, or soldering operations, simply provide the proper fixture and heating coil, then determine the heating time required for the job and proceed with the operation. The average shop worker can easily learn how to operate the machine. No special skill is needed. Changing from one job to another requires only the changing of the work fixture and determining the heating cycle.

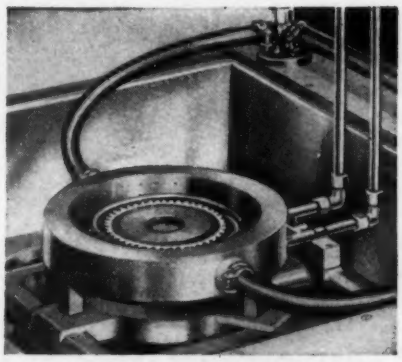
CONSERVES ALLOY STEELS—Van Norman Induction Heating Units conserve alloy steels because they enable manufacturers to surface harden parts at the points of wear, giving these sections the strength to stand up under greater stresses. Thus, ordinary carbon steels can be used in many places where more expensive alloy steels were previously used.

REDUCES SPOILAGE—Since warping, scale, and distortion are practically eliminated, rejects through spoilage are minimized, and part after part can be turned out exactly alike.

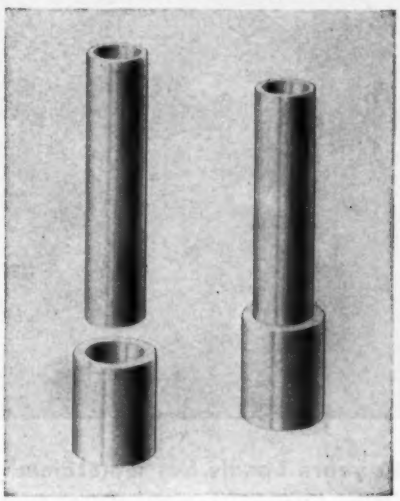
UNLIMITED APPLICATIONS—The Van Norman Induct-O has practically no limit to its applications for hardening, annealing, forging, brazing, soldering, melting, etc., within their work capacities. The only requirement is the use of a proper work holding fixture and heating coil. Shown at left is the 32KW Induct-O with quench table, work-holding fixture and coil for a typical hardening application.

The new Van Norman Induct-O Catalog contains valuable information on the possibilities, advantages and applications of high frequency induction heating. Write for your copy, today.

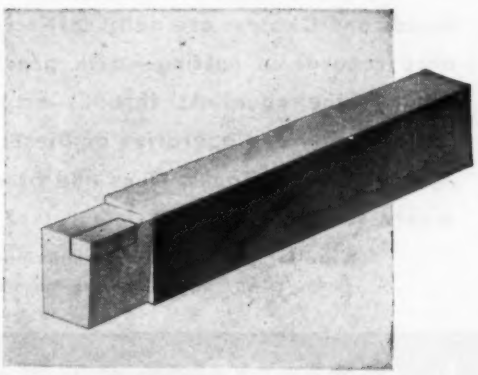
VAN NORMAN COMPANY
ELECTRONICS DIVISION
SPRINGFIELD 7, MASSACHUSETTS



Illustrated is a typical operation . . . surface hardening the teeth of a gear. The total operating time for surface hardening this gear is twenty seconds.



A typical soldering application performed with the Van Norman Induct-O. Irregular as well as regular parts are quickly and easily soldered.



Brazing carbide tips to mild steel tool shank is quickly performed. In illustration, tip is brazed to shank in but a few seconds.

"It pays to Van Normanize"

★ In WAR as in PEACE

LANDIS
Leads
In
Quality
Accuracy
Performance

For 40 years Landis has maintained a standard of quality, accuracy and performance accepted by industry throughout the world. Today LANDMACO Threading Machines, Die Heads and Chasers are daily setting performance records in cutting—with precision accuracy—the countless threads employed in the assembly and operation of Diesel Engines, Aircraft, Ships, Tanks, Guns and other implements of war.

Write for Bulletin No. H 75 descriptive of the LANDMACO Threading Machine

LANDIS MACHINE CO.
WAYNESBORO, PENNA.

LANDIS

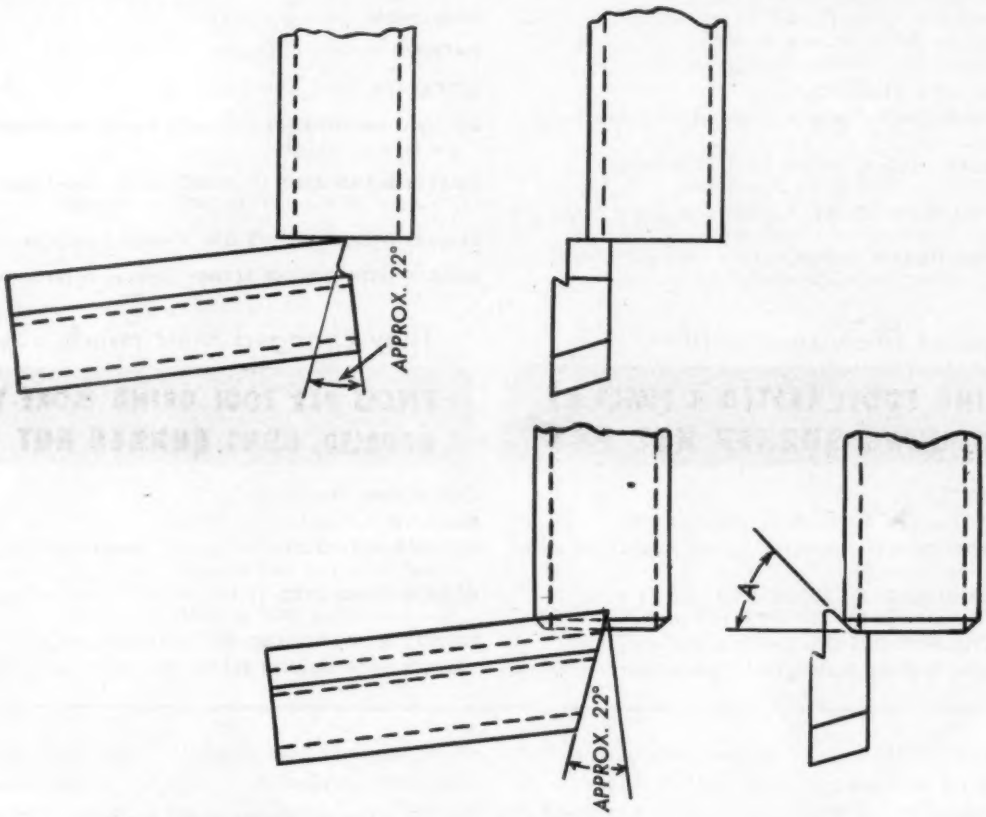
LANDIS TRADE-MARK

THREAD TIPS

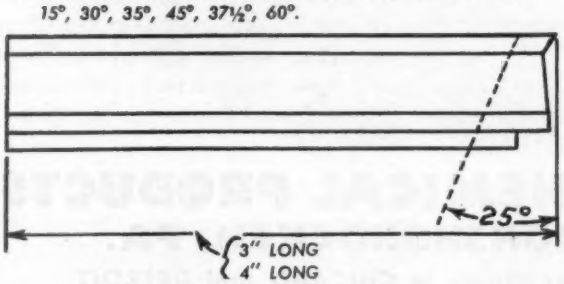
A Good Mechanic Knows and Cares For His Machine

In the Interest of Efficiency, Better Workmanship and Higher Production

LANDIS Beveling and Facing Cutters for Pipe have same inherent feature—"Long Life"—as Landis Tangential Chasers



* BEVELING ANGLE "A" OF BEVELING AND FACING CUTTERS.
15°, 30°, 35°, 45°, 37½°, 60°.



These drawings show the recommended method of grinding Landis Cutters for square end facing or beveling pipe for welding.

Be Threadwise—Employ LANDIS Long Life Tangential Chasers

LANDIS MACHINE COMPANY, WAYNESBORO, PENNA, U.S.A.

OF COURSE YOU ARE USING "THE BEST" CUTTING OIL

These people thought so... until—

QUAKER KUT #45 GAVE THEM 4½ TIMES AS MANY GEARS PER TOOL GRIND

OPERATION: Finish cut on Bevel Gear (20 teeth, 5 pitch, 14.5° pressure angle; 221 strokes per minute).
MACHINE: Gleason 12″ straight tooth generator.
STOCK: SAE 4615. Brinell 179.
OIL USED PREVIOUSLY: Nationally known chlorinated—fatty sulphur oil.
QUAKER BLEND USED: QUAKER KUT #45—1 part; Paraffine oil (Vis. 100″ @ 100°F.)—4 parts.
RESULTS WITH PREVIOUS OIL: Cutters averaged 8 pieces per grind. Also, honed cutters every 3 gears.
RESULTS WITH QUAKER BLEND: Cutters averaged 36 pieces per grind and still in good shape when stock ran out.

They thought so too... until—

QUAKER KUT #45 MADE POSSIBLE A 1500 PER CENT INCREASE IN TAP LIFE

OPERATION: Tapping 1½ NPT.
MACHINE: Automatic Tapper.
STOCK: 4140 Steel, Brinell 355—388.
OIL USED PREVIOUSLY: Nationally known chlorinated sulphurized oil used straight.
QUAKER BLEND USED: QUAKER KUT #45—1 part; Paraffine oil (Vis. 100″ @ 100°F.)—6 parts.
RESULTS WITH PREVIOUS OIL: Average 1 piece per tap.
RESULTS WITH QUAKER BLEND: Average 16 pieces per tap.

This plant likewise... until—

MILLING TOOLS LASTED 4 TIMES AS LONG, USING QUAKER KUT #45

OPERATION: Milling.
STOCK: Steel forgings: Rockwell "C" 32—"C" 36.
OIL USED PREVIOUSLY: Nationally known sulphurized chlorinated oil used straight.
QUAKER BLEND USED: QUAKER KUT #45—1 part; Naphthenic oil (Vis. 100″ @ 100°F.)—9 parts.
RESULTS WITH PREVIOUS OIL: Tools changed every day.
RESULTS WITH QUAKER BLEND: Tools changed every *fourth* day.

They changed their minds... when—

PIECES PER TOOL GRIND MORE THAN DOUBLED, USING QUAKER KUT #45

OPERATION: Broaching.
MACHINE: National.
OIL USED PREVIOUSLY: Nationally known sulphurized, chlorinated cutting oil used straight.
QUAKER BLEND USED: QUAKER KUT #45—1 part; Mineral oil (Vis. 240″ @ 100°F.)—1 part.
RESULTS WITH PREVIOUS OIL: 450 pieces per grind of tool.
RESULTS WITH QUAKER BLEND: 950 pieces per grind of tool.

QUAKER KUT #45 is one of the many *new type* products for the metal working field developed by Quaker's Research Laboratory. Fundamentally, it is the result of combining sulphur with fatty waxes not heretofore used in cutting fluids, and the *polymerization* of this substance under high pressure in the presence of a catalyst.

QUAKER KUT #45 is a concentrated "base" which, when blended with ordinary mineral oil, forms a new type of cutting fluid from which the combined sulphur is released very gradually . . . only to the extent required to prevent metal-to-metal contact . . . hence it remains effectively sulphurized for an extended period. It also possesses extreme pressure qualities and excellent lubricating, cooling and anti-weld characteristics. For more technical data and performance reports . . . or for the services of a *Quaker Process Engineer* . . . use the handy coupon below.

QUAKER CHEMICAL PRODUCTS CORP.
CONSHOHOCKEN, PA.

Other Plants in CHICAGO and DETROIT
Warehouse Stocks in Principal Industrial Centers

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

TOOLS ARE WEAPONS

TREAT 'EM RIGHT!

FOR MORE TECHNICAL DATA, USE THIS

QUAKER CHEMICAL PRODUCTS CORP. • CONSHOHOCKEN, PA.

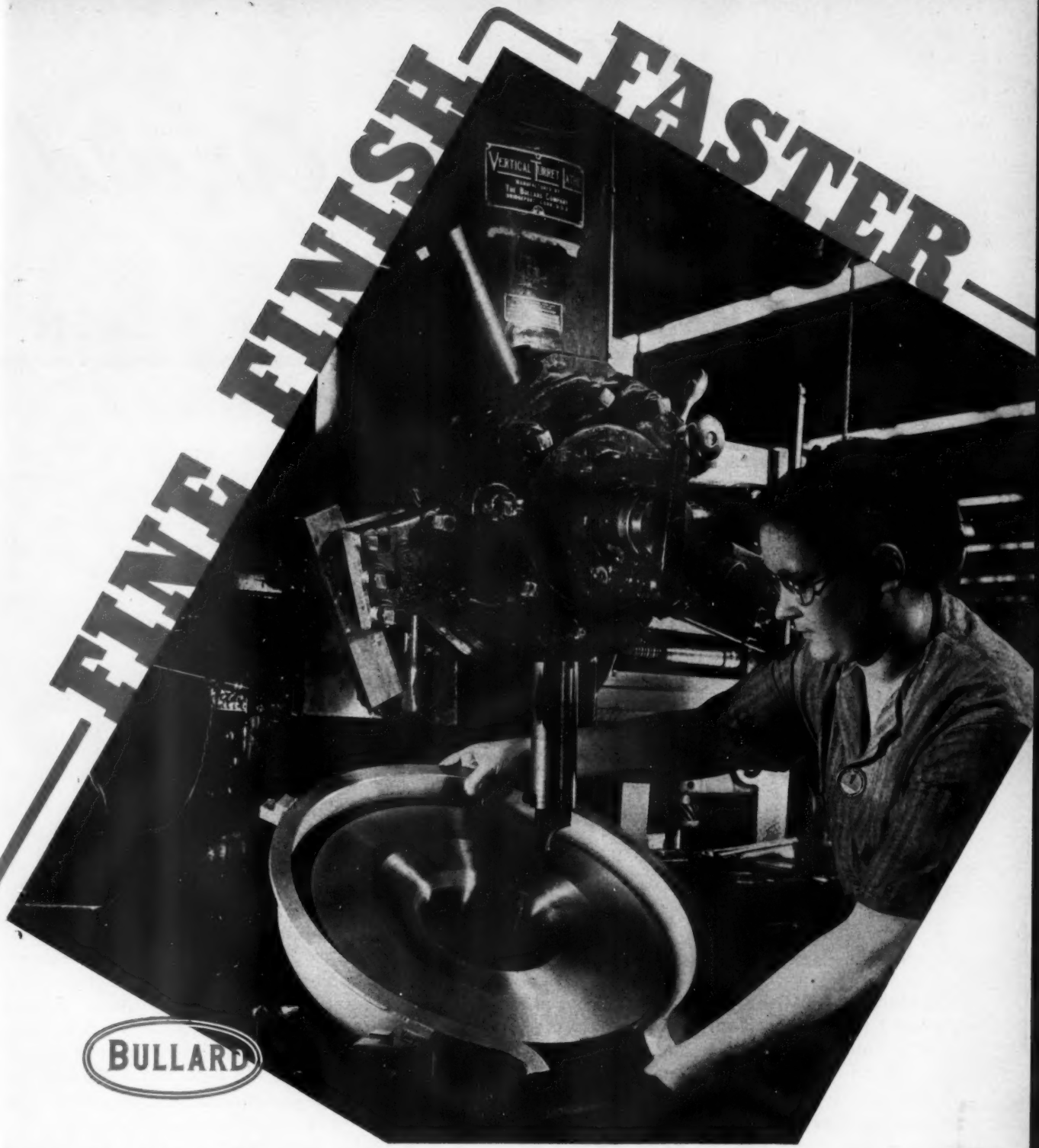
☐ Send me additional Production and Technical Data on QUAKER KUT #45.

☐ You may have a QUAKER PROCESS ENGINEER contact me to arrange a test run in our plant—without cost or obligation to us.

Name _____ Position _____

• • • • PLEASE PRINT COMPANY NAME AND ADDRESS IN MARGIN BELOW • • • •

FINE FINISH — FASTER



Do the products you make have to be held to fine limits? The rigid vertical design of the Bullard Vertical Turret Lathe is assuring fine limits in scores of vital industries. Are you striving to exceed quotas already high, with a dwindling supply of skilled labor? The V.T.L. saves time by cutting with two heads at once . . . saves time between cuts.

Today, as America's production rises to incredible heights, the Vertical Turret Lathes play their part in bringing this war to the "finish" we all desire. Tomorrow, these same advantages will weigh heavily in their owners' favor in the battles of peace-time competition.

BULLARD VERTICAL TURRET LATHES

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

1 Roller bearing manufacturer grinds small inner roller bearing raceways to a finish of 5 to 6 micro-inches. Before the installation of the Landis 4" Type H, a separate polishing operation was required in order to secure this finish.

SUPERIOR

The statement that better ground finishes are demanded today is not news to any informed person in industry. How to economically secure these better finishes is another matter entirely.

If you are a manufacturer of those smaller than average parts which must be ground to a superior finish, there may be news for you on these two pages. The machine you need is the Landis 4" Type H Plain Hydraulic. It's new—new from the floor up. Yet during the several years it has been offered, hundreds of manufacturers have found that they can depend upon its unfailing ability to impart the kind of a finish they want.

Why does the 4" Type H Plain fill this need so competently? As might be expected, there are a number of reasons, chief among which is the Microsphere wheel spindle bearing construction. The close clearance at which the wheel spindle may be operated is a major aid. Extra large spindles, shafts, guideways and castings generally play their bit in the securing of these extra fine finishes. So do multiple V belt drives and the absence of gears, chains and sprockets.

Judged by any of the accepted methods of determining quality of finish, parts ground on the Type H are superior to those turned out on less up-to-date equipment. The accompanying examples tell their own story without further comment here.

427

LANDIS TOOL COMPANY
WAYNESBORO—PENNSYLVANIA

ing Small Parts

HYDRAULIC GRINDERS

PRECISION LANDIS GRINDERS

2 Valve manufacturer grinds stem of airplane valve to an exceedingly high commercial finish. These valves are hollow and the steel used is particularly tough. The left-hand corner of the wheel is radiused so that the stem diameter will blend into the radius under the head. Notwithstanding the finish required, a production of 90 per hour is maintained removing .007" to .008" stock.

3 Small tool manufacturer grinds the shanks of 5/8" taps on an exceedingly high production basis within a limit of .0005". The customer is particularly satisfied because the finish is better than actually required for this type of work in spite of the fact that the square head and upper end of the tap flutes create an irregular surface. The Landis Type H is turning out work in one operation which previously required both a roughing and a finishing operation. Even so, this one operation imparts a better finish than the former finishing operation.

FINISH

4 Automobile manufacturer grinds hardened steel cam rollers to an average finish of 4 to 6 micro-inches. The unusual thing about this installation is the amount of stock removal. .010" stock is ground off of each roller during the operation but in spite of this, the finish already mentioned is consistently maintained. A production of 500 pieces in 10 hours (two are pressed on a double tapered arbor and ground at the same time) further attests how the 4" Type H responds where requirements are severe. These results are secured by a female operator.

5 Specialty manufacturer grinds a small hardened tungsten steel fuel injector plunger and regularly imparts a finish of two micro-inches. Some of the operations are straight infeed and some are traverse but the same high standard of finish is maintained in both cases.

Unusual Performance as Usual

A SOLUTION
TO A VITAL PROBLEM...

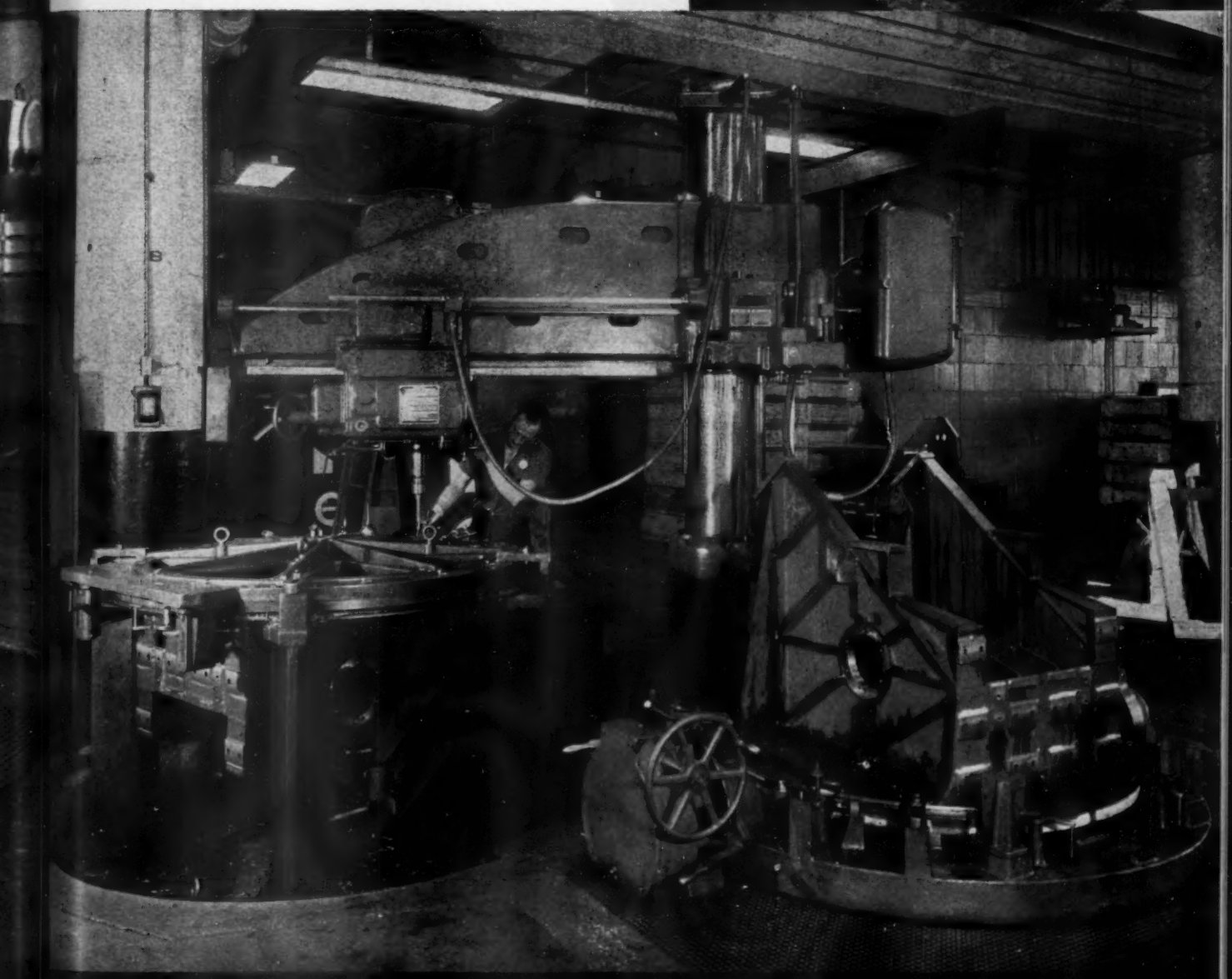
THE AMERICAN TOOL WORKS CO.

In war industries especially, the man power problem is coming more and more acute. Contractors are avidly searching for a solution—many have found a helpful approach to such a solution by installing labor saving equipment.

The accompanying illustrations show Link Belt Ordnance Company's method of conserving man hours in drilling gun mount frames by using "American" Hole Wizard Radial Drills in combination with tilting work-holding fixtures designed and built by them. By means of this tilting fixture, all the drilling, tapping, and spot facing operations on the holes are accomplished at one work setting, resulting in a tremendous saving of man hours on this one piece alone.

"American" Hole Wizard Radials were selected for this important job because of their convenient, centralized controls and ease of operation and their proven stamina under heavy production pressure.

We welcome the opportunity to discuss such problems with you.



Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

YANKEE CRAFTSMANSHIP
Assures Eye Appeal....

GRINDERGRAM

Keep your grinding machine clean and well oiled. The results from improved performance will be reflected in ease of production and pride of craftsmanship.

NORTON
and

Artificial Silkworm depends for accuracy on NORTON LAPPERS

WITH customer acceptance of sheer stockings and dainty garments depending on the uniformity of the rayon thread it spins, the Zenith viscose pump must give positive, undeviating performance. Even minute variations in thread size lead to faulty dyeing and weaving, causing color variations and expensive rejects.

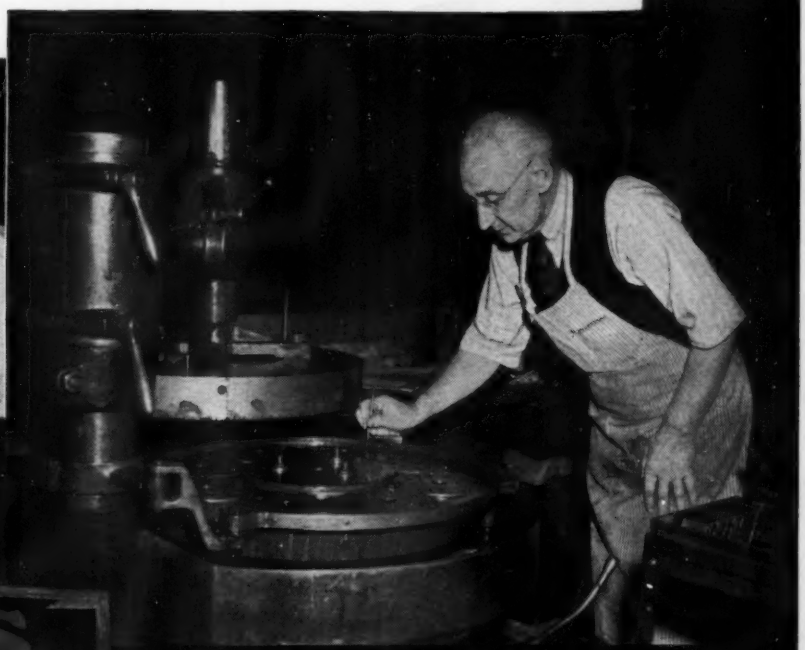
In the manufacture of this precision mechanism W. H. Nichols and Sons of Waltham, Massachusetts, years ago turned to Norton Lapping Machines to obtain long-lived dimensional accuracy together with economical production. Today lines of Norton Lappers in the Nichols plant, working to limits of 0.000025", attest the shrewd Yankee wisdom of that early selection — for the Zenith pump has been termed "the most accurate assembly of commercial parts ever produced".

We consider it a privilege and a Norton engineering achievement to have been associated with the Nichols organization in obtaining such accuracy as is inherent with the Zenith rayon pump.

NORTON COMPANY • Worcester 6, Mass.

M-476

enith pumps are pressure tested to deliver ithin 0.8 grams in 10 minutes.



Pump parts, checked by optical instruments, are lapped to .000025" limits in Norton lappers.

GRINDERS
Lappers

Pile on the work . . . your

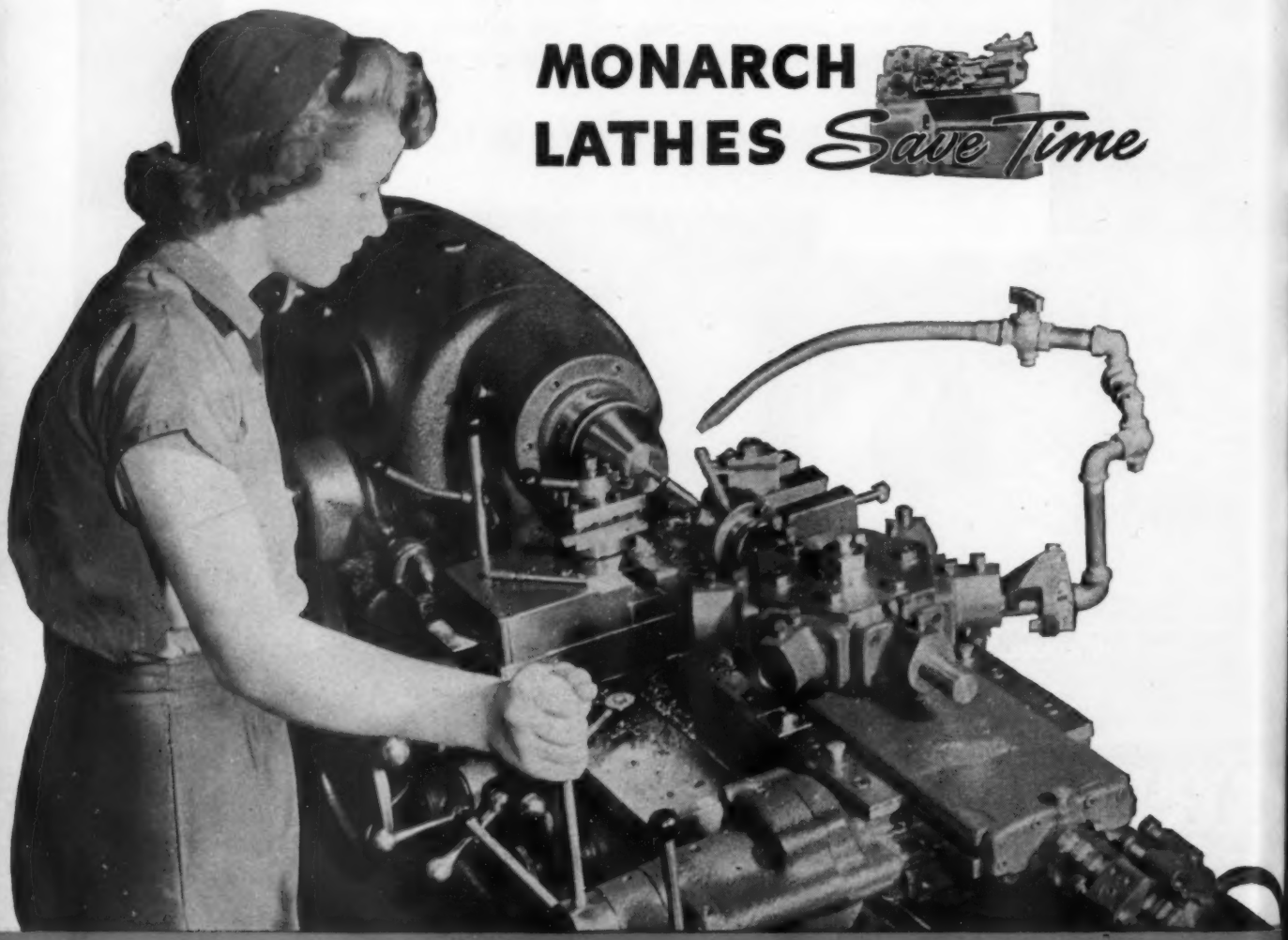
It's a bear for work, this Monarch Sensitive Precision Toolmaker's Lathe. Give it a job within its range, and you'll get it turned, quickly and accurately.

It's simplicity itself to operate. Inbuilt precision and sturdiness assure maintained accuracy on one-piece or repetitive work. Give it the aid of some of Monarch's special attachments, as illustrated, and watch the chips fly!

This Monarch lathe, like other members of the Monarch family, has done yeoman service in our war production program. When we return to peacetime products, you'll find it the time and moneysaving answer to thousands of lighter turning jobs for re-tooling or for mass production.

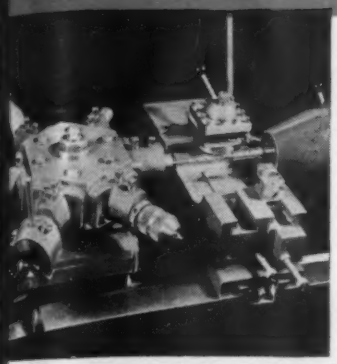
Pile on the work . . . your Monarch lathes can take it!

MONARCH LATHES *Save Time*



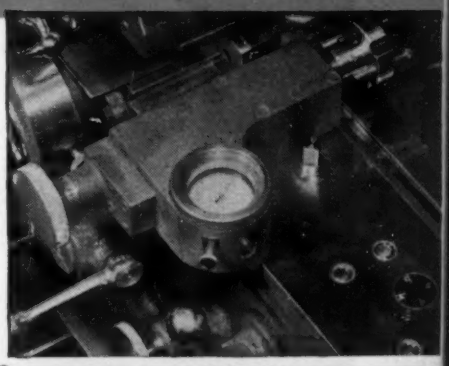
THE MONARCH MACHINE

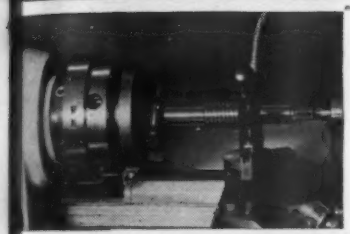
Monarch Lathes can turn it!



Hexagon ram-type turret, with hand-operated double connected slide and lever-operated drawing attachment, fits this Monarch toolmaker's lathe for practical turret lathe production of small parts, to the required accuracy.

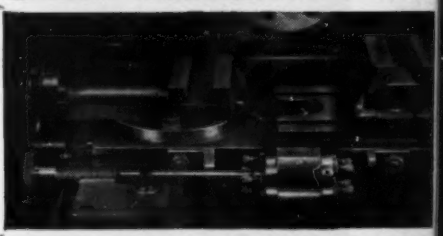
Dial-type diameter stop has dial indicator for both turning and boring, with four positions controlled by knurled knob.

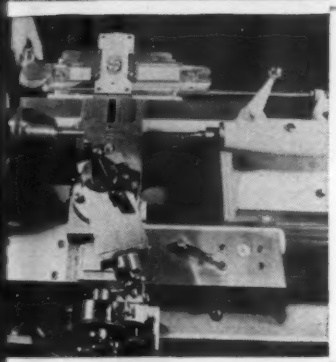




Multiple index faceplate provides accurate index of driver plate for chasing either external or internal multiple threads.

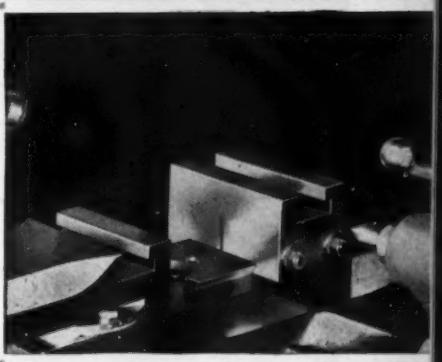
Multiple positive diameter stop has four positions for both turning and boring, brought into position by convenient knurled knob.

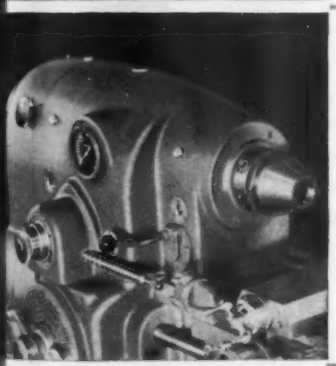




Taper turning attachment, with micrometer adjustment, for turning extremely accurate and smooth tapers.

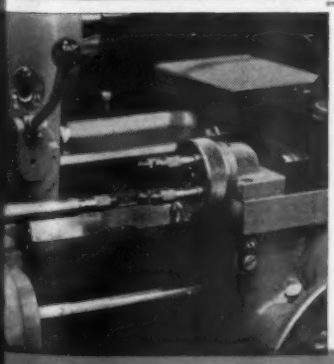
Connected compound and plain block rear rest is especially useful for turning, necking or chamfering operations.



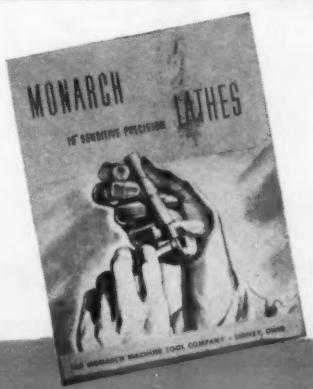


Lever-operated collet chuck is a great time saver on production jobs. A simple push releases the work and a pull tightens the work in the collet.

Floor-type cabinet and collet rack provides easy accessibility and convenient storage for chucks, rests, plates, wrenches, collets and tools.



Multiple positive length stop has four positions and four micrometer heads for fine adjustments.



SEND FOR DETAILS!

Time and moneysaving features of Monarch 10" Sensitive Precision Toolmaker's Lathes and accessories are described in our Bulletin No. 10EF-F. Please ask for it on your letterhead as paper shortage limits distribution. Address The Monarch Machine Tool Company, Sidney, Ohio, or branch office listed in your telephone book.

TOOL COMPANY • SIDNEY, O.

PROPER SHARPENING MEANS LONGER HOB LIFE

SINCE the demand for hobs is still taxing specialized manufacturing facilities beyond capacity, it is important that users of these precision cutting tools employ every possible means to see that each hob delivers its maximum useful life. *Carelessness in sharpening may result in unnecessary waste of potential cutting power.* The original sharpening on the hob must be exactly duplicated when it becomes dull or the hob will lose some of its accuracy and produce unacceptable work. Valuable life is then lost in resharpening it correctly. If allowed to become too dull before it is sharpened, a needlessly large amount of material may have to be removed. Accurate spacing of cutting teeth must be maintained to provide uniform cutting action. A number of our customers have studied this problem in great detail as it applies in their own plants, and have set up sharpening standards resulting in substantial economies. The fundamentals of proper hob sharpening are illustrated and explained on pages 272–282 of our booklet, "How To Get The Most Out Of Your Hobs". We suggest that everyone in your plant who is concerned with the use and handling of hobs be acquainted with these factors in order to *get the most out of your hobs!*

SEE PAGES 272-282

Buy War Bonds

BARBER B-C COLMAN PRODUCTS
HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

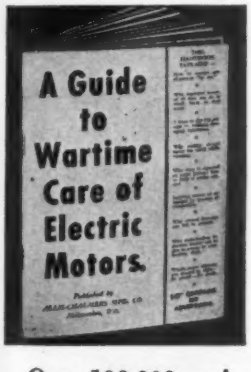
Barber-Colman Company

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

FIRST AID FOR MOTORS

MOTORS RUN A FEVER? No wonder if they do more often today. They're working *3 and 4 times* as many hours as in peace!

Wartime conditions demand you diagnose motor ailments *quickly* . . . remedy the trouble at once. At right are but few of the many diagnoses found in Allis-Chalmers' new "Guide to Wartime Care of Electric Motors". In maintenance as in war, *attack is the best defense.* This book singles out the 9 main enemies of electric motors . . . tells you how to get them *before* they get your motors!



Over 100,000 copies already in use.

Write today for your *free* copy. ALLIS-CHALMERS MFG. CO., MILWAUKEE 1, WIS.

SYMPTOMS YOU CAN SEE

Symptom	Possible Causes	Cure
1. Excessive sparking or flashing at brushes. Blackened commutator.	Rough commutator.	Sand or turn down, depending upon depth of surface roughness.
	Low bar on commutator.	Grind or turn down balance of commutator.
	High bar on commutator.	If extreme, lower with mallet, tightening clamping ring. Grind true.
	Brushes too short.	Replace with harder grade—if worn too soon . . . and not by rough commutator.
	Shorted armature winding.	Test for short—after removing metallic contact between commutator bars. Repair.
2. Intermittent sparking at brushes.	Open armature winding.	Locate and replace bad coil—or repair defective joint.
3. Motor won't start.	Usually line trouble.	Correct. Check source of power supply.
	Load too heavy. See if motor runs without load.	Reduce load—or replace motor with unit of greater capacity.

SYMPTOMS YOU CAN HEAR

4. Excessive hum.	Uneven air gap. Measure with feelers.	Replace bearings—before introduction of scraping noise indicates rotor is rubbing.
	Unbalanced rotor. Check on parallel bars.	Balance with solder on band—or weight attached by cap screw and lock washer.
5. Regular clicking.	Matter in air gap.	Take out rotor; remove matter.
6. Rapid knocking	Misalignment.	Realign set until knocking disappears.
7. Brush "chatter."	Extreme vibration.	See item 10, below.

SYMPTOMS YOU CAN FEEL

8. Vibration.	Misalignment.	Realign set.
	Vibration in driven machine.	Eliminate source in machine, if possible. Or a flexible belt drive may be in order.
9. Motor overheating. (Check with thermometer—don't depend on hand).	Overload. Measure load; compare with nameplate rating.	Check for excessive friction in motor, drive or machine. Reduce load, or replace motor with greater capacity unit.
	Dirt in motor. Check flow of air.	Blow out motor. Use solvent on wound section if necessary.
	Rotor rubs stator.	Replace bearings.

A 1638

ALLIS-CHALMERS MOTORS

When you do need new motors, look into the strength, solidity and all-around protection of the new "Safety Circle"—protected top, sides, ends and bottom.

AC WE WORK FOR VICTORY WE PLAN FOR PEACE

ONE LOOK . . . and no questions asked!

WHEN buying machine tools of any kind equipped with tapered roller bearings, insist on seeing a sample of the bearing used, and look for the trade-mark "TIMKEN" stamped on both *cup* and *cone*. If you see it you'll know exactly what you're getting.

When selling Timken Bearing Equipped machine tools, point out this trade-mark to the prospective buyer. Your selling time and cost—as far as the bearings are concerned—will end right there. One look—and no questions asked; such questions as: "Who makes them?" "Are they correctly designed?" "Are they made of good steel?" "Has the bearing manufacturer had specialized experience in applying them to this kind of equipment?"

THE TIMKEN ROLLER BEARING COMPANY
CANTON 6, OHIO

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

"PUT IT ON THE BLANCHARD"

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- Production
- ★ Adaptability
- Fixture Saving
- Operation Saving
- Material Saving
- Fine Finish
- ★ Flatness
- ★ Close Limits

★ . . . . . *Especially valuable on jobs like the one illustrated.*

HERE are two surface grinding problems that came to the Blanchard Engineering Department in one week:

(1) Grind a hardened steel ring 86½" in diameter to a tolerance of ±.0002" for thickness.

(2) Grind the edges of a steel strip, .005" thick, .125" wide, and 20" long, straight and to a tolerance of ±.0005".

Thirty years experience in grinding flat surfaces enabled Blanchard Engineers to solve the grinding of both of these jobs, using Blanchard vertical Surface Grinders and Blanchard Grinding Wheels.

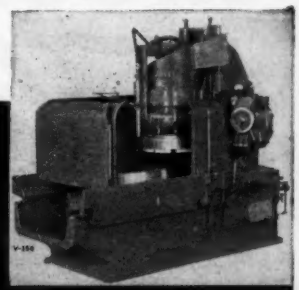
If you have work which lies within the range here indicated, you should investigate the possibilities of a Blanchard.

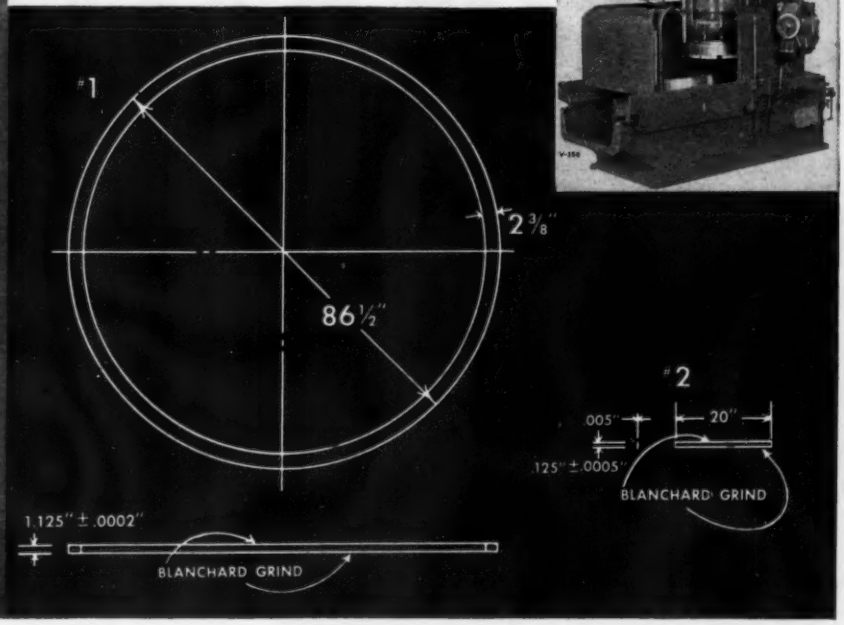
Whether the job is large or small, usual or unusual, Blanchard can show you how to grind it better and faster.

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

Grinding Hardened Steel Rings and Edges of Steel Strip on Blanchard Surface Grinders.





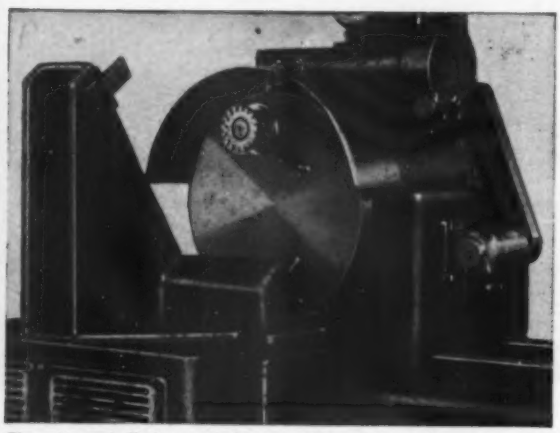
BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

Hydraulic feed and rapid traverse move the cutter head transversely on hardened and ground steel ways. A variety of work fixtures can be mounted on the bed.

CROSS SPECIAL *Floor Type Miller*

Cross' development of a Floor Type Miller with traversing head is of particular importance to the manufacturer who was forced to start quickly and at any expense by improvising with standard machine tools. With exceptional range and flexibility, it is constructed to handle a variety of work with little time required for changeover and set-up. The bed is arranged to receive many different kinds of holding fixtures—vertical, horizontal, angular, indexing, compound, rotary feed, rise and fall. The full automatic operating cycle is controlled from a central push button station and it can be set to automatically perform plain face milling, contour milling, profile milling, slotting, rotary milling, and operations requiring the cutter to traverse an irregular path.



The cutter spindle is mounted in a cradle which can be set to oscillate or rotate thru any predetermined arc. Oscillatory and transverse cutter movements may be synchronized to suit the work.

A review of current practice will reveal many opportunities to consolidate operations and put them on an automatic basis with improved accuracy and reduced manpower. Cross engineers are prepared to assist you in applying special machinery to your manufacturing problems.

CROSS GEAR & MACHINE CO.

Established in 1898

DETROIT, MICHIGAN, U.S.A.

S-2

There are many GOOD THINGS AHEAD . . .

Soybeans will certainly be one of the country's important crops in the future. A single acre of land devoted to them will produce about seven times as much protein as it would if planted to corn for the feeding of hogs.

The war has checked the spread of quick-freezing locker plants which were spreading across the country from the farming states at the rate of about fifty new plants each month. A million patrons are already withdrawing two million pounds of food from their lockers daily. Home-sized quick-freezing units will probably be combined with mechanical refrigerators in after-the-war models.

The fluorescent tube may have many uses besides those already familiar. Inks that show under ultra-violet light are already in use to mark laundry, and are being tried out in hospitals for the identification of babies. Fluorescent materials help in the detection of theft and sabotage, and in the detection of altered documents. Fluorescent lighting distinguishes between butter and margarine, determines the freshness of eggs and nuts, or the adulteration of coffee, lard and olive oil. Experts can even tell, with its help, from what flowers a sample of honey has been made.

Powdered glass is being pressed into shapes and fused by heat in a manner similar to the technique used for powdered metals.

A machine is reported in which a photo-electric cell scans a drawing and operates a machine that produces the part shown in the drawing.

Cotton, laminated with thermo-setting plastics, is being tried as a substitute for sole leather . . . semi-flexible, water repellent, and similar in appearance to leather, but longer wearing.

New "rare-element" glass that contains no sand makes optical glass for camera lenses with twice the speed of any former lens.

A new method of cutting metal uses slightly worn band-saw blades run at approximately ten thousand feet per minute. The high speed of the saw actually melts the metal in its path.

Baking dishes can now be made of special paper that resists heat to 350 degrees.

The photo-electric cell (or electric eye) was first introduced to the public as an automatic door-opener. Now it sorts fruit, smoke and fire, levels elevators, records automobile speeds, counts pills, matches colors, sorts merchandise, turns on lights, measures machined parts, detects flaws in metal and is the heart of television. Its use has only begun.

Backyard gardeners will be pleased to know that experiments are being made with high-frequency currents to kill insect pests in the ground.

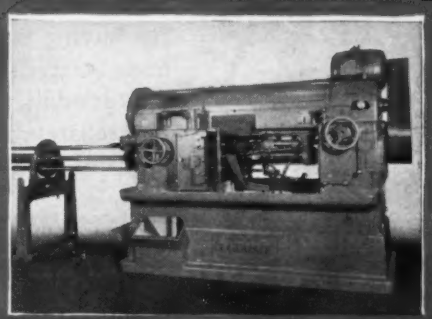
An immediate post-war demand is expected for two million one-hundred thousand automobiles, one-million five-hundred thousand mechanical refrigerators, one-million two-hundred thousand washing machines, one-million two-hundred thousand radios, nine-hundred thousand electric irons, and six-hundred thousand electric sewing machines.

The Basic Magnesium, Incorporated, plant near Boulder Dam, largest single electrical installation in the country, uses eighteen million dollars worth of silver in place of copper to carry its current.

A patent has been issued for a method of transcribing eight hours of continuous reading by variably magnetizing a spool of fine wire the size of an ordinary spool of cotton. With this wire in a radio-like machine, a housewife could attend to her domestic chores and listen to the reading of an entire book at the same time.

A new camera takes three million pictures in a single second.

If you are looking ahead
you will be interested in production like this



This 4¼" bronze valve stem is produced on the 6-spindle Conomatic in nine seconds — nine seconds for eleven operations including four forming cuts, four cuts with roller turners, two threading operations and cutting off — all to close tolerances.

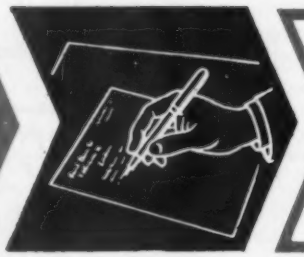
This is real production — the sort of production that is winning the war — the sort of production that you will need in your plant to meet competition when the war is over.

CONE

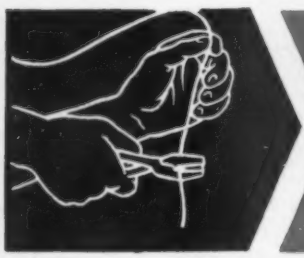
AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

You Save[1] and Save[2] and Save[3]

1 SAVE ORDERING TIME



Instead of buying two separately mounted devices—a motor-circuit switch and a magnetic starter—you buy one factory-co-ordinated unit that controls and protects your motor. Simply specify the motor rating and indicate the type of motor-circuit switch you want—and we'll send you the control you need.

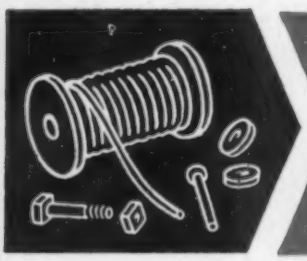


2 SAVE INSTALLATION TIME

Users report a 50 per-cent reduction in mounting time, 40 per-cent reduction in wiring time, as compared with the installation of two separate devices. You mount one device—not two. You connect only nine terminals—not fifteen. You get your motors into operation quicker.

3 SAVE MAN POWER

By eliminating one complete mounting job on every installation, you save valuable man power. And because the cover cannot be opened while there is power on the starter, your men have more protection against accidental injury.

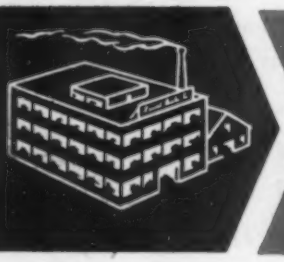


4 SAVE CRITICAL MATERIALS

By buying both the motor-circuit switch and the magnetic starter as one compact unit, you save copper wire, steel conduit, and fittings that are necessary for installing two separately mounted devices—plus the saving gained by using only one steel enclosure instead of two.

5 SAVE MONEY

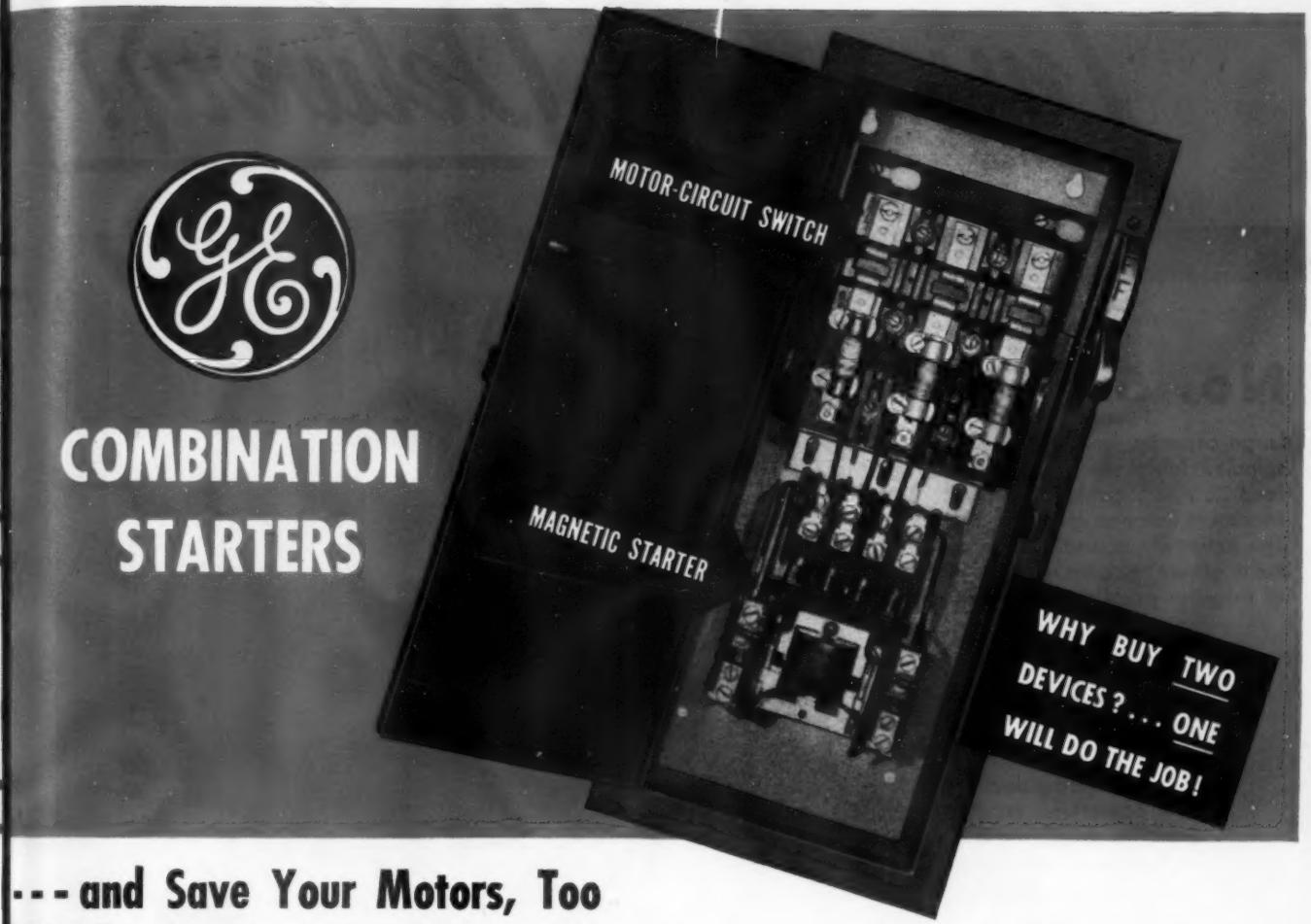
Combination starters cost slightly more than two separately mounted devices, but this difference is more than made up by the savings in wire, conduit, fittings, and installation-labor costs. This statement is based on the actual experience of users.



6 SAVE PLANT SPACE

Combination starters take up less mounting space than separately mounted safety switches and starters. Because of this you can mount them in small, unused places near the operators.

and Save[4] and Save[5] and Save[6]...



COMBINATION STARTERS

- - - and Save Your Motors, Too

With G-E combination starters, you're sure that the motor-circuit switch or breaker has the proper rating and interrupting capacity for the magnetic starter with which it is used. The fuses or breaker are coordinated with the thermal overload relays to give complete motor protection under short-circuit or overload conditions.

It's the simple, logical way to get control and protection for your motors—in one compact, easy-to-install unit. Why buy two devices, when this one will do the job?

NAME YOUR HAZARD

G-E combinations come in enclosures to meet any operating condition: dust-tight, watertight, oil-immersed, general-purpose, or for hazardous locations. Available for motors from 1 to 1000 horsepower.

Next time you order motor control, save seven ways by specifying General Electric combination starters.
General Electric Company, Schenectady, N. Y.

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

General Electric Company, Section H676-129
Schenectady, N. Y.

Please send me the bulletins checked below:

- GEA-3715—Combination starters: general-purpose, watertight, and dust-tight
- GEA-3660–2300-volt combination starters
- GEA-3804—Combination starters for hazardous locations
- GEA-3541—Oil-immersed starters

Name.....

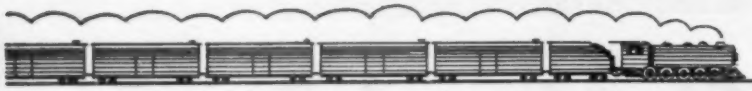
Company.....

Address.....

City.....State.....

8920

GENERAL ELECTRIC



FOR

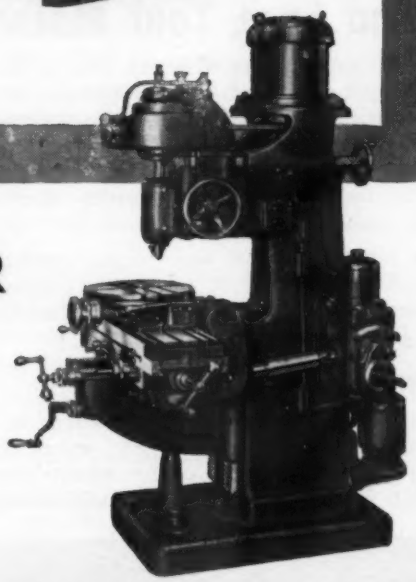
Immediate Delivery!

REED-PRENTICE
No. 5 VERTICAL MILLER

Large capacity, heavy duty milling machine with helical gear drive to spindle. Table working surface . . . 68" x 16". Longitudinal power feed . . . 48", cross power feed . . . 16".
Maximum distance end of spindle to table . . . 30". Weight 11,500 lbs. This extremely accurate miller can be supplied with duplicating equipment governing cross and longitudinal feeds for quantity production of irregular parts or for vertical head movement for die sinking.

No. 5 JIG BORER

As a jig borer the No. 5 is equipped with precision measuring devices for extremely accurate operations on jigs, fixtures or small quantities of accurate parts where expense of fixtures is not warranted. Power down feed is standard equipment.



No. 3VG VERTICAL MILLER

For general manufacturing work we offer the 3VG Milling Machine. Table working surface . . . 10¼" x 36". Vertical Adjustment of knee . . . 18", adjustment head on column . . . 5". Weight 2850 lbs.

Duplicator equipment for irregular contour or profile milling can be supplied.

BRANCH OFFICES
1213 W. 3rd. St.
Cleveland. Ohio
75 West St.
New York City. N. Y.

REED-PRENTICE CORP.

MAIN OFFICE
WORCESTER
MASS. U. S. A.

Speed on the production line with

P&J

AUTOMATIC CHUCKING EQUIPMENT

Accelerates delivery of our guns to the firing line

OTO BY
S ARMY
AL CORPS

Duplicate parts—for airplanes, airplane engines, tanks, Bofors guns, 90 mm anti-aircraft guns, machine guns, adaptors for shells, the American Aerlikon gun and other products of war—are being turned out at big time savings on P&J equipment. Accuracy and speed are being maintained with a minimum of man-power because P&J Automatic Chucking Equipment can be operated in batteries with one attendant serving several machines at the same time.

P&J pioneered the development of machines for producing duplicate parts. Today, P&J is able to throw more than forty years experience into the job of "achieving the impossible." If production figures were permitted here they would be almost unbelievable in the light of past performance, excellent as it was in pre-war days.

P&J offers its experience to help you solve your production problems.

POTTER & JOHNSTON MACHINE COMPANY
Pawtucket, R. I.

THIS SCRAP OF PAPER TAKES THE SCRAP TO THEM

Buy More
WAR BONDS

1822 Makes Sense 1944

• "The history of the wars in Europe furnishes a complete demonstration that no system of conduct, however correct in principle, can protect neutral powers from injury... that a defenseless position and a distinguished love of peace are the surest invitation to war... and that there is no way to avoid it other than by being always prepared and willing, for just cause, to meet it."

• *Message of James Monroe, President, to the Congress of the United States, 1822*

GENERAL MACHINERY CORPORATION

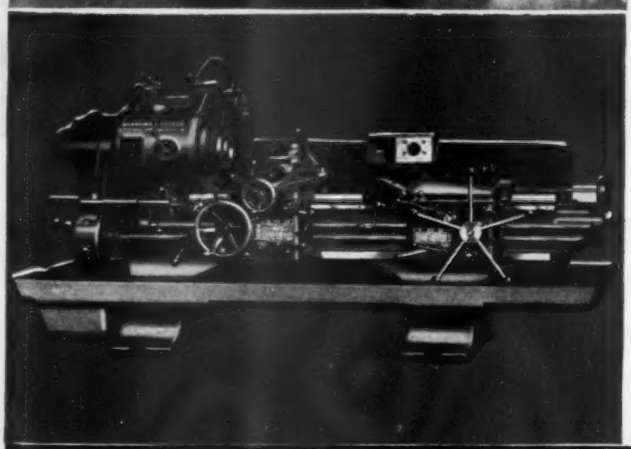
GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION



Preselecting the Speed

FOR THE NEXT CUT

Means not only more parts produced at the end of the day. It also means that the operator feels less fatigued and more able to enjoy his hours of leisure.

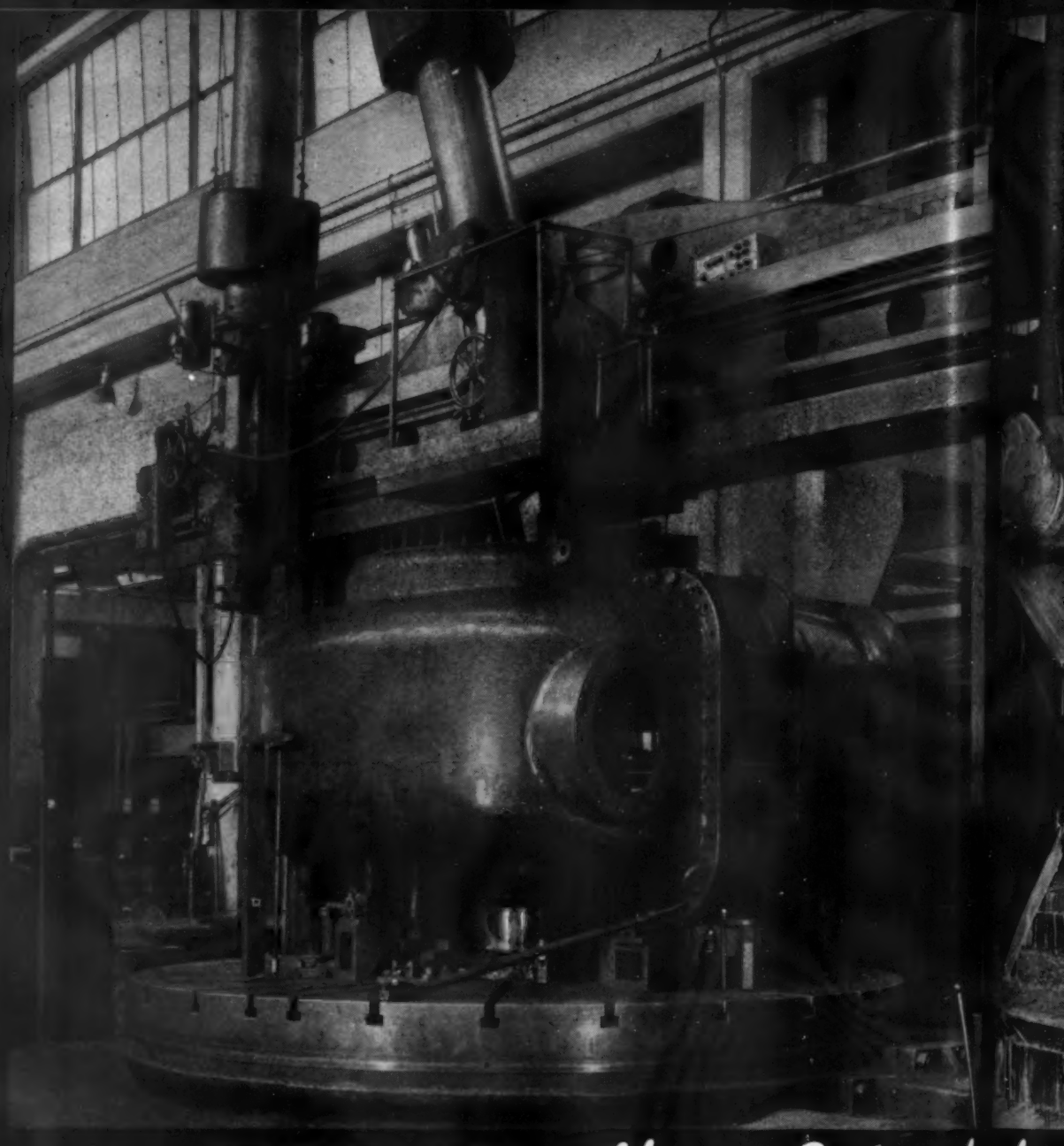
Merely turn the drum type dial while the machine is working. Select either the spindle speed in revolutions per minute or the cutting speed in feet per minute for the next cut. Then when the feed drops out change without delay to the new speed.

This and many other outstanding features of the BARDONS & OLIVER NO. 21 SADDLE TYPE UNIVERSAL TURRET LATHE are described in the new catalog.

Write for your copy today.

BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO



BETTS 14' BORING MILL boring inside of a low-pressure steam turbine casting.

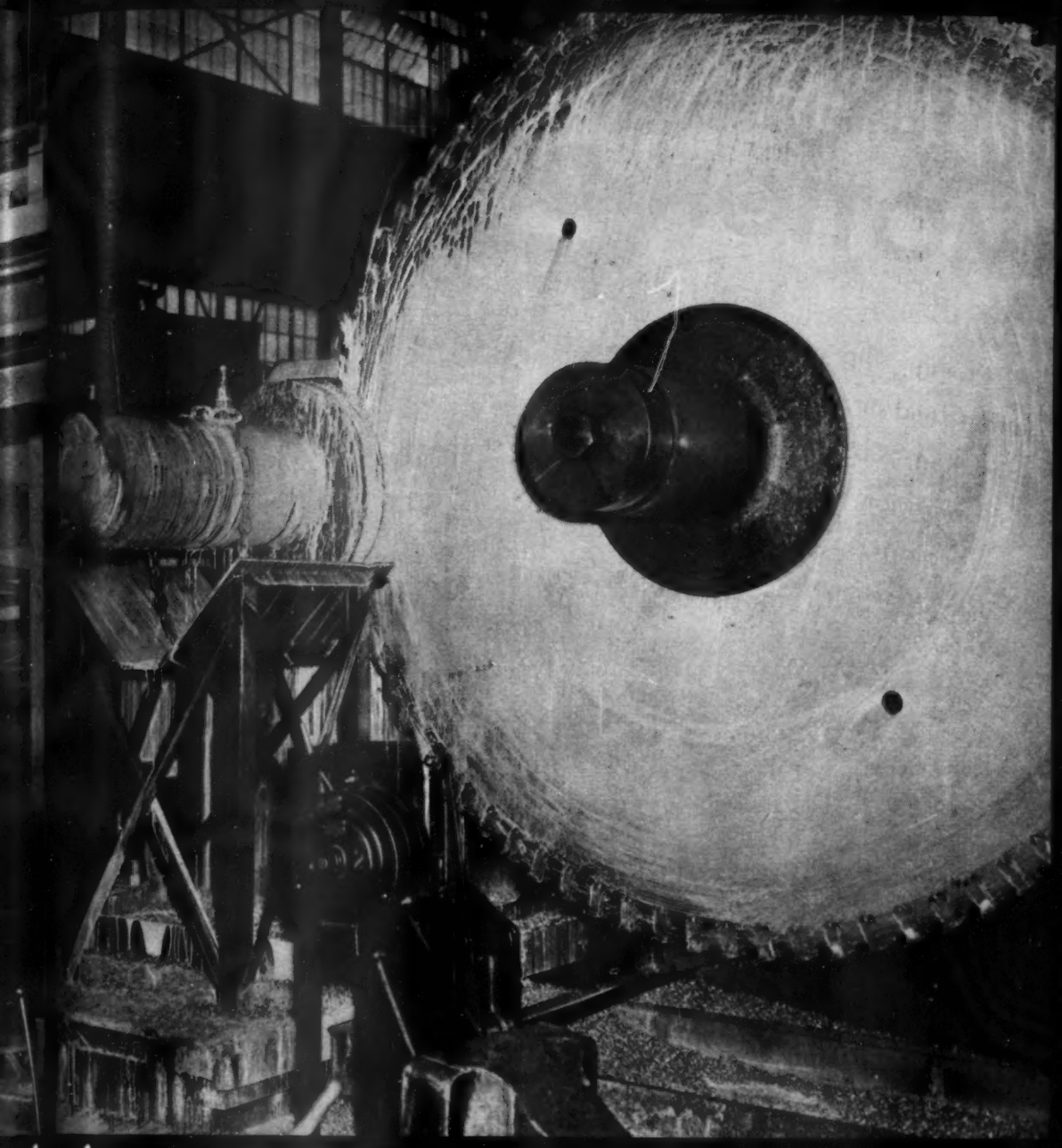
TODAY *They Work fo*
TOMORROW *They'll W*

That's the advantage of using Consolidated built machine tools — they do many types of work and do them well. The Betts Boring Mill and Newton Cold Saw illustrated above for instance, are general purpose tools that will work for

BETTS BETTS-BRIDGEFORD NEWTON OLBURN

CONSOLIDATED MACHINE TO

ROCHESTER 10 NEW



NEWTON COLD SAW in operation. Use of a 120" blade enables this saw to cut stock of large diameters or of irregular shapes requiring unusual clearance.

k for VICTORY
ll Work for PEACE!

peace as well as war. Right now you are probably making plans for the future. Please remember that Consolidated makes practically any type of big machine tool you will need. We'll gladly quote to your requirements.

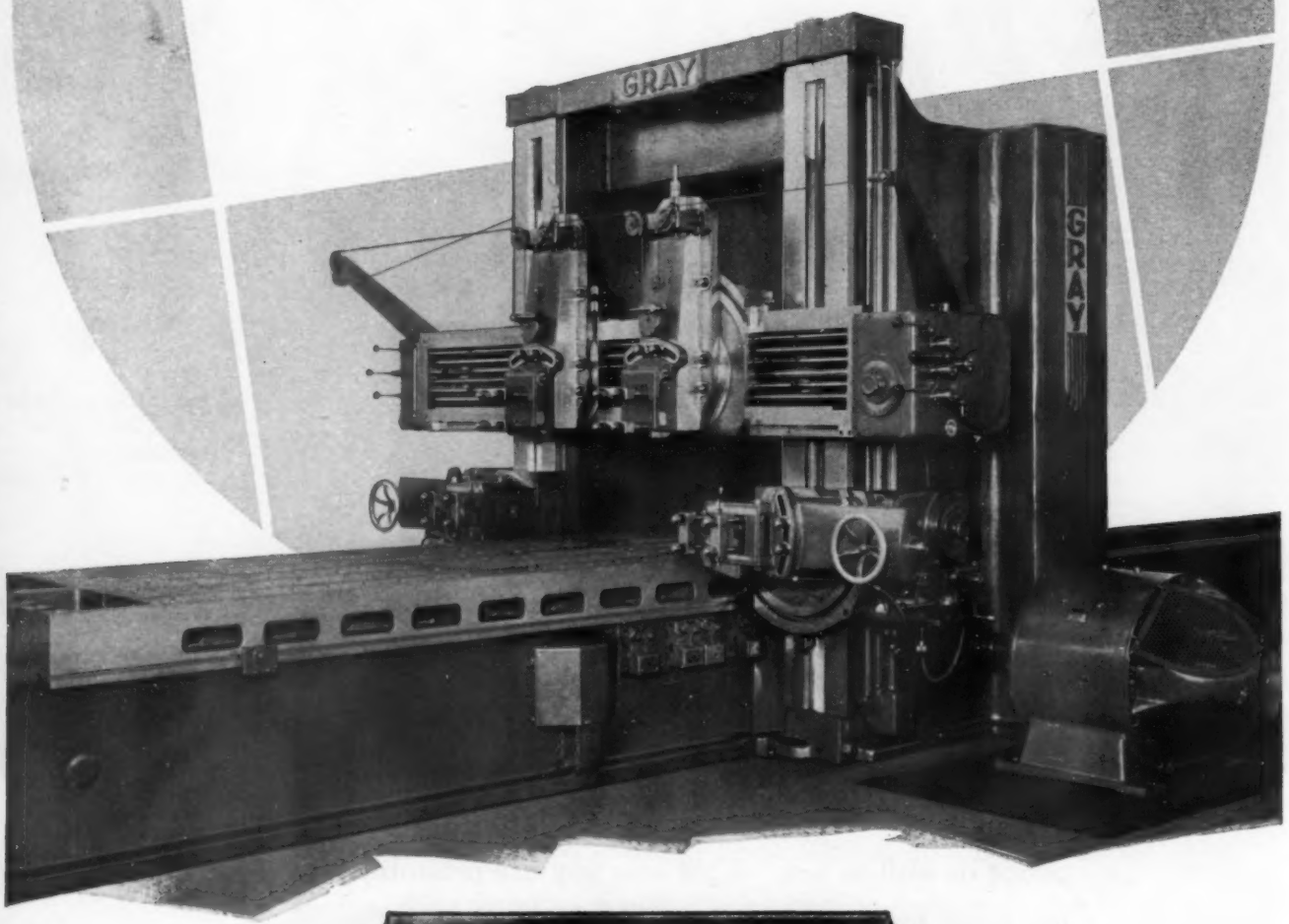
YTON OLBURN HILLES & JONES MODERN

ETOOL CORPORATION

10 NEW YORK

ONE MOTION DOES IT . . .

● A single flip of a single lever will give you either feed or rapid traverse of any head in any direction. Convenience of control and simplicity of operation, combined with surplus power, and the rigidity to make full use of it, characterize Gray Maximum Service Planers.



THE G. A. GRAY COMPANY
Cincinnati Ohio, U.S.A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

How can machine tools avenge this

Dunkerque in Arkansas?

This is no enemy propaganda. No "usually well-informed sources" or Berlin broadcasts tell this tale. This is real . . . this is here . . . and this is defeat.

Our own private *peacetime* Dunkerque — in Arkansas, in New York, in West Virginia or California — in countless American "homes" where millions of people are ill-housed, ill-clothed, and bodily and mentally ill-fed.

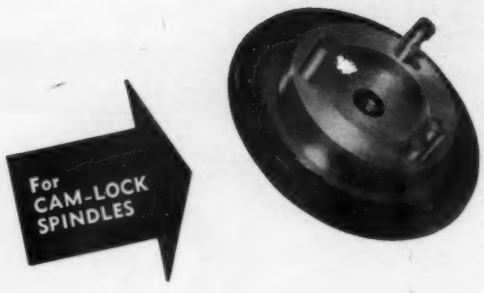
What part will machine tools play in turning this kind of defeat into victory? The *whole* part, if the men of industry have the vision and the freedom to plan ahead, and to carry out what they plan.

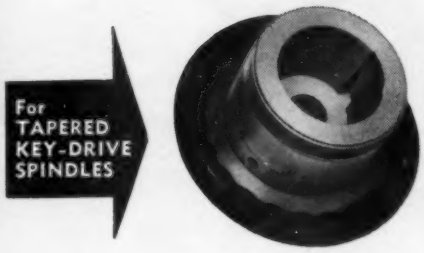
If you are a manufacturer, there is one thing you can do at once: Have your production men and planners consult now with the engineers of the leading basic machine tool producers. They can help you in planning today your part in the peace that must be won after the war is won.

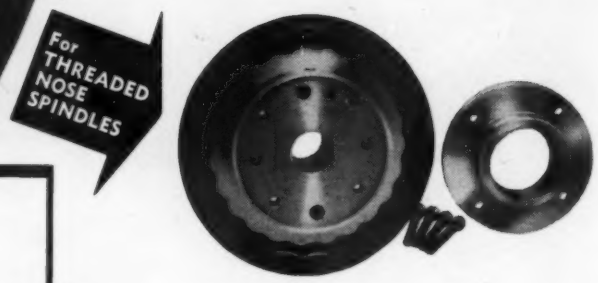
One of these is a Bryant man. . . . We invite you to send for him.

BRYANT

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U. S. A.







GET MORE PRODUCTION from YOUR LATHES and MILLING MACHINES with HARDINGE-SJOGREN *SPEED COLLET CHUCKS*

HARDINGE
ELMIRA, N.Y.

A Hardinge-Sjogren Nose Type Speed Collet Chuck enables you to get full value from your investment in tool room lathes, engine lathes and milling machines. It gives greater capacity, saves time, increases accuracy and assures better results.

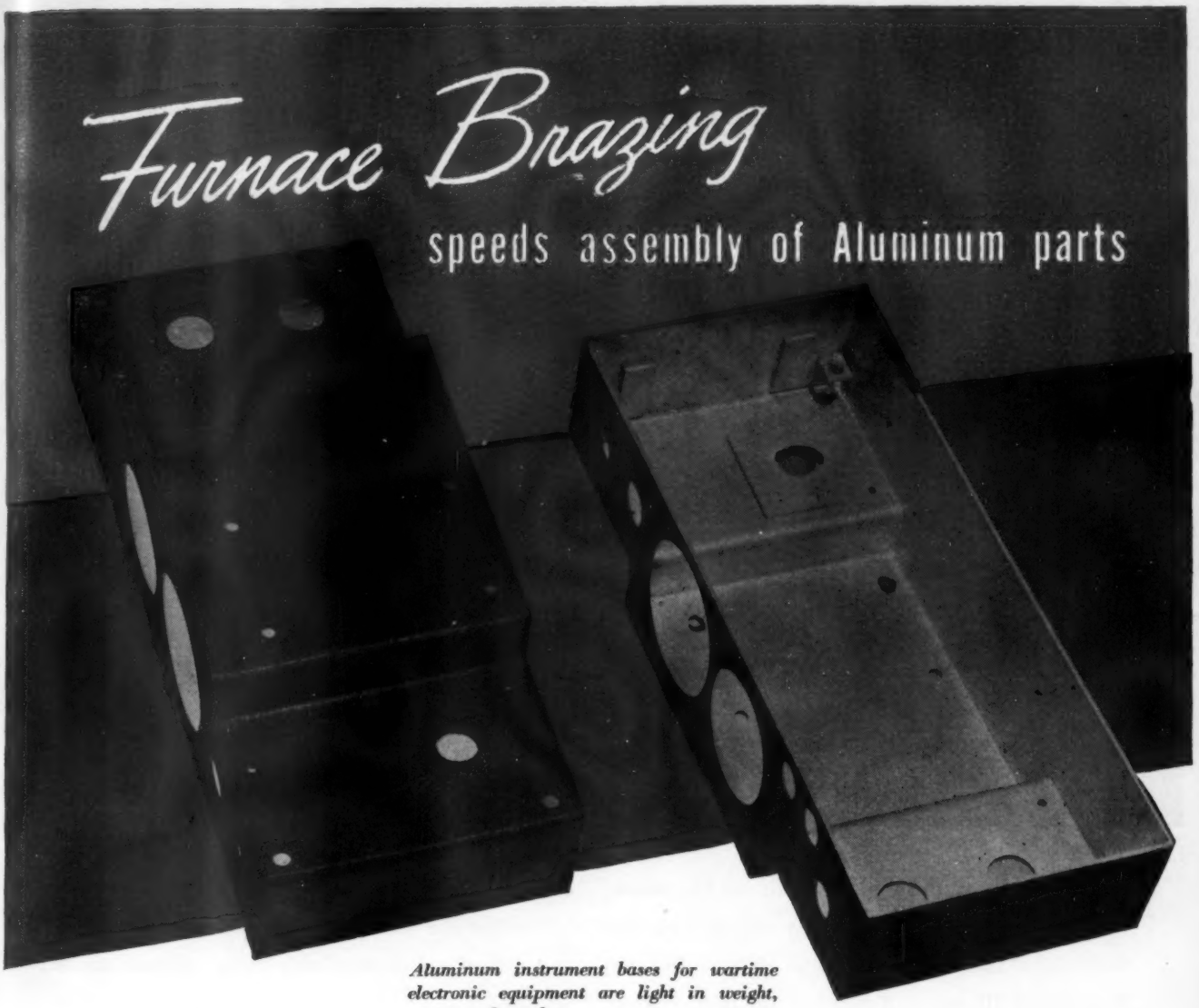
The amazingly fast action of the Hardinge-Sjogren Speed Collet Chuck gives it full right to its name. An almost effortless turn of the handwheel, one way or the other, automatically opens or closes the collet, releasing or gripping the work as desired. Its grip is adjustable and sure. Production is increased as the operator is always in front of his work.

Available in three sizes for 1", 1-3/8", or 1-3/4" collet capacity.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Furnace Brazing

speeds assembly of Aluminum parts



Aluminum instrument bases for wartime electronic equipment are light in weight, strong and sturdy.

Formed from Alcoa Aluminum brazing sheet, the joining of the top to the side walls of this instrument base is completed in a brazing furnace. The job goes fast. Man-hours are low. The part is accurate, neat, rigid and strong. All of the usual advantages of aluminum are retained; light weight, resistance to corrosion, fine appearance.

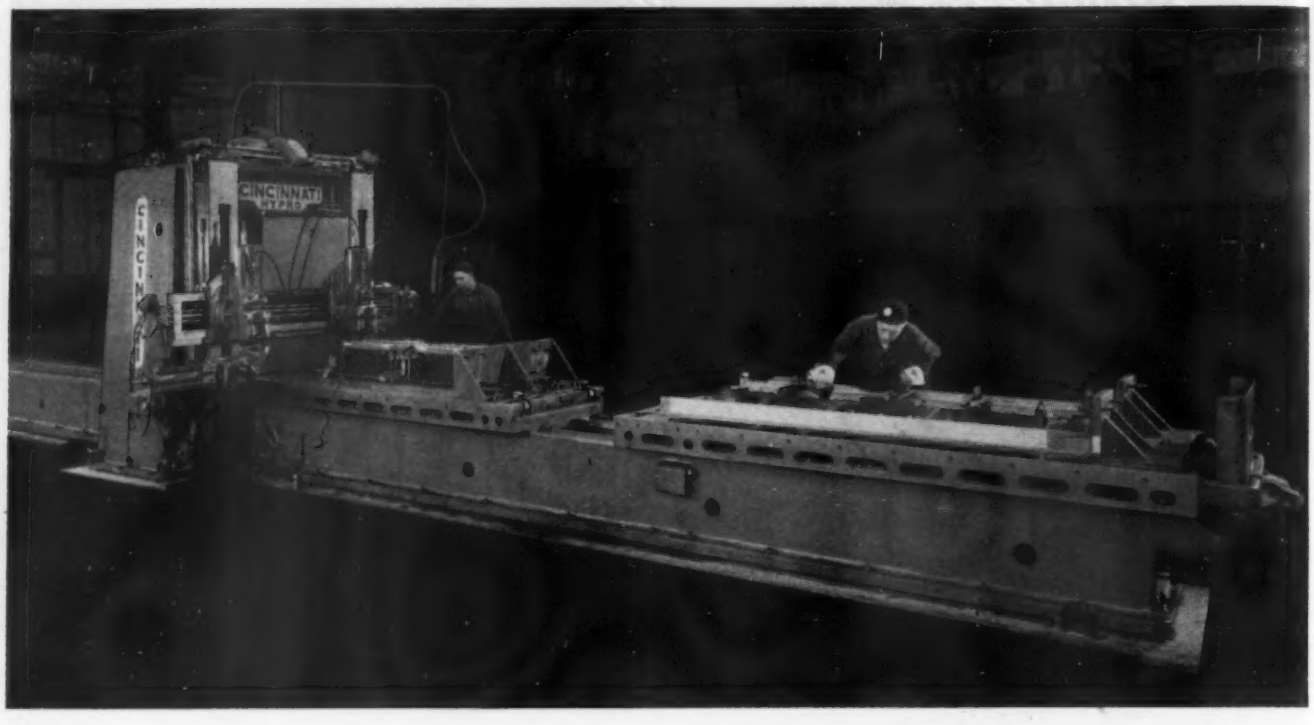
Many a product used by our fighters is getting to them faster because this brazing method of assembling aluminum was adopted. Perhaps you can employ the process to similar advantage, reducing the time and labor required for production, simplifying and improving your products. Alcoa engineers will gladly help you decide.

Too, there may be places where Alcoa Aluminum Alloys will effect additional savings. The light weight of aluminum, its ease of fabrication, make work go faster. Attractive, durable finishes are easy to apply. The use of aluminum may relieve bottlenecks caused by shortages of other materials.

For help on wartime production problems, and data that will assist in including Alcoa Aluminum Alloys in postwar designs, write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALCOA ALUMINUM REG. U. S. PAT. OFF. **ALUMINUM**

BEATING THE OLD TWO TO ONE RATIO
with a Cincinnati Hypro Planer



Often one modern planer can do the work of two old machines. But by the use of the two-piece table arrangement offered by the Cincinnati Planer Co. production is increased by more than the usual two to one ratio for new over old planers.

The two piece table is recommended where quantities are large and the setup time is comparable to cutting time.

One table is used to machine a job while the other table is used to set up the job to be planed next. When the machining operation is completed the operator hooks up the table on which his next work is set up, moves it over the bull gear, disconnects the table with the finished work and begins planing on the new job while the finished parts are removed from the other table and the next operation is set up.

Total floor to floor time per piece thus amounts to cutting time only. Production is almost doubled even on the latest model planer by use of a set up man, working two tables alternately.

When longer work is to be planed the two tables are joined together and operate the same as any one-piece table.

Our engineering and time estimating departments are at your service. Let us solve your planing, boring and milling problems.

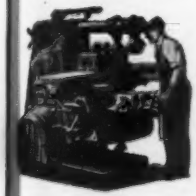
THE CINCINNATI PLANER COMPANY
Planers...Vertical Boring Mills...Planer Type Millers
CINCINNATI . OHIO . U.S.A.

What will your future **I.P.** *be?*

†† This is the Second of a series of advertisements presenting "Industrial Par" and its importance to your company in all future planning. Save this and succeeding I.P. advertisements as the basis for discussion and as a guide to your planning program.

So much from so little

The Annual National Investment* in machine tools represents only 2% of the total value of products produced by machine-tool-using industries.



YES — in the ten peace years 1927 to 1937 — the builders of machine tools produced a yearly average of 122 million dollars worth of equipment for American industry. The industries that bought and used these machine tools were able to produce an average of about 9 billion dollars worth of peacetime products annually in those same years. The annual investment in machine tools represented only about 2% of the total value of products created by these machine-tool-using industries — the makers of engines and turbines, agricultural and construction machinery, automobiles, planes, locomotives, household appliances and many other useful things.

In terms of productive power this is impressive — certainly "very much from very little." But what significance have these rather startling ratio "figures" to industrial management? Industrial statistics show that the national output per man-hour tends to increase constantly — its previous rate of 2½% per year compounded can be expected to advance to 4% or 50% increased output per man-hour every 10 years.

Manufacturers who intend to keep step with a high level of national prosperity — the volume production which means more goods for more people at lowest cost and security of jobs and wages for the greatest number of workers — must strive to attain the 50% increased output pace. Certainly full advantage must be taken of the inherent ability of machine tools to achieve the most with available man-hours, for only with the most modern machine tools can any manufacturer hope to compete successfully over a period of years as well as make workers' jobs safer, easier, and more productive.

Isn't it only logical to equip your plant with machine tools — those possessing the greatest sustained productive power, the ability to produce fast, accurately at lowest cost — the better to win your race with competitors in the world of peace production to come?

Back the attack **BUY MORE BONDS**

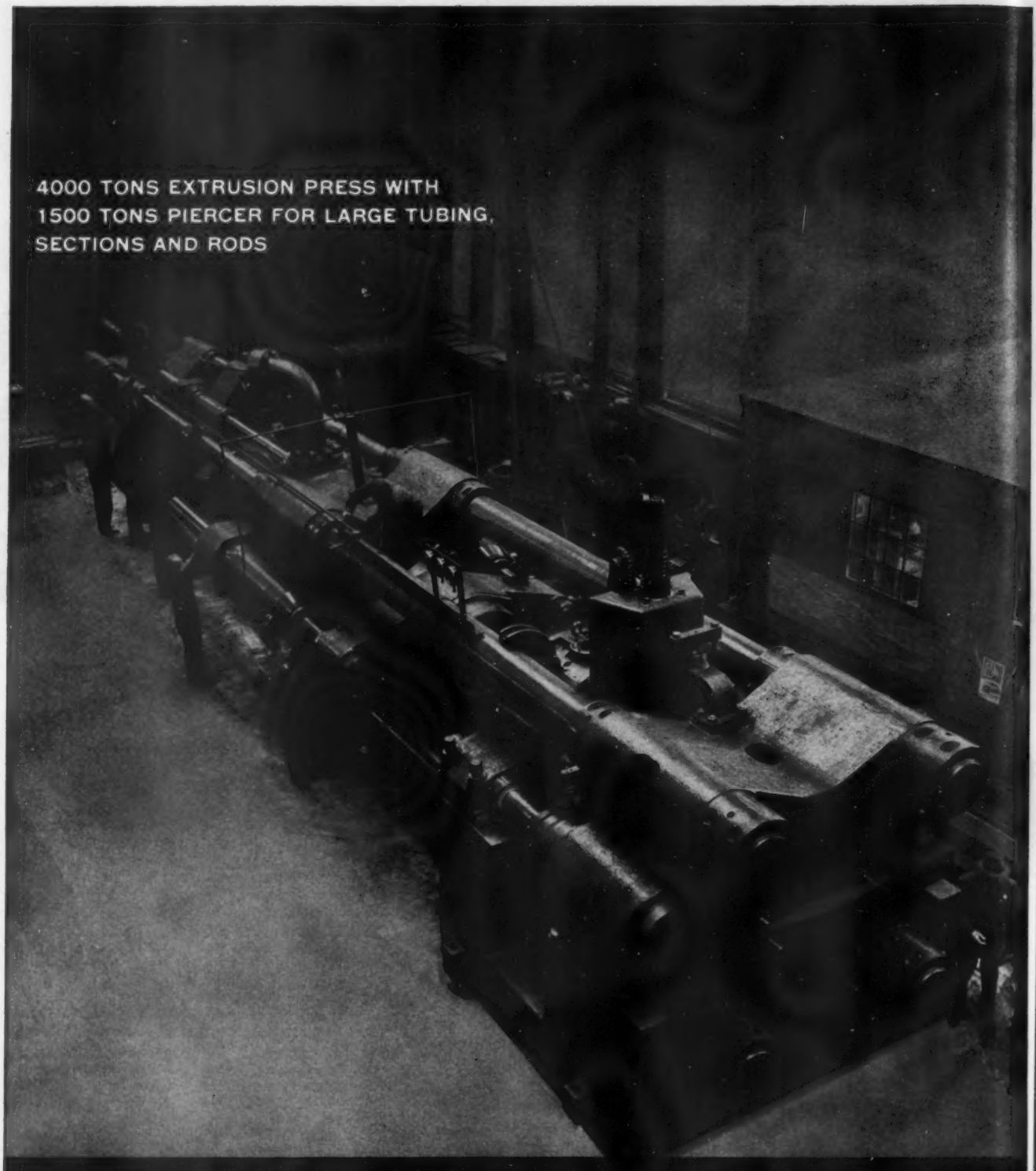
Spotlight facts for your future I.P. *planning*

* Production methods — developed in wartime — increase man-hour output; pent-up buying power — released in peacetime — demands increased production.
* The rate of 2½% increase per year output per man-hour, established by a 12 year record of industrial production, can be expected to reach at least 4% per year — compounded.
* Manufacturers must set a goal of 50% increased output per man-hour every 10 years — to maintain a high level of national prosperity and achieve its benefits in terms of security of jobs and wages for the greatest number of workers and the volume production of more goods for more people at lowest cost.
* Machine tools — the most modern, most efficient — are recognized as the most effective implements of mass production and increased output at lowest cost — but only continual replacements with the newest and finest machine tools assures full productive capacity. *Such replacements yearly should be equal to 10% of the total machine tool investment — in keeping with increased output.*
* The cost of machine tools is insignificant in terms of their productive power . . . from 1927 to 1937, according to census reports, American manufacturers had only a total of about 2% invested yearly in machine tools in ratio to a total volume of 9 billion dollars' worth of production annually.

†† **Industrial Par** — *the constantly increasing output per man-hour equal to approximately 50% every 10 years.*

KEARNEY & TRECKER
CORPORATION
MILWAUKEE 14 WISCONSIN

Milwaukee Machine Tools



HYDROPRESS · INC.

ENGINEERS *CONTRACTORS*

HYDRAULIC PRESSES · ROLLING MILLS
STRETCHERS · PUMPS · ACCUMULATORS

570 LEXINGTON AVENUE · NEW YORK · N. Y.

NEW SPEED FROM NEW ACCURACY!
THE OLD WAY — Just 40 years ago, the Wright brothers made their first flight. How crude and flimsy was this hand-made plane compared with the aircraft that pour from American plants today.
THE NEW WAY — In 1944, airplane production lines testify to new production speeds, made possible partly by the dependable new accuracies of precision instruments and production tools.

WEAR-TESTED MATERIALS STEP UP TODAY'S PRODUCTION

American war industries quickly found they could obtain new speed from the consistent accuracy of Woodworth precision gages, ground thread taps, form tools and other perishable production tools.

Wear-tested metals give Woodworth accuracy its extra-long life. Every piece of metal used in Woodworth gages is tested for wear by the severest modern methods.

Old in experience and resourcefulness, Woodworth has charted new ways to speed war production and to cut inspection costs.

After the war, we shall continue to build to that same accuracy, passing on to Woodworth customers all the benefits of Woodworth production methods and their resultant efficiency, which the new peacetime economy will demand.

Our Engineering and Development Departments are available for consultation on special operating and production problems involving gaging and production tools.

ACCURACY YOU CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD · DETROIT 20, MICHIGAN

PRECISION GAGES · GROUND THREAD TAPS · FORM TOOLS · PRECISION MACHINED PARTS · HEAT TREATING · PLATING

He Never Has to Take His Eyes Off the Cutter and Work

DEVLIEG JIGMIL

Spindle start, stop and reverse—

Power vertical feed and rapid traverse movement—

Power horizontal feed and rapid traverse movement—

Power automatic table retraction and repositioning—

Power feed and rapid traverse to bar movement—

are all carried in a master switch on the spindle head—at the operator's finger tips.

Thus, the operator of the DeVlieg Jigmil can fix his vision on the cutter and work—never has to look at controls during operation.

The Jigmil is what a machine tool should be—a powerful and accurate extension of the operator's hand. The value in precision boring and milling is apparent.

It's a NEW *Type Machine*

Spacing Accuracy of a Jig Borer . . . Performance Qualities of a Milling Machine . . . Convenience and Flexibility of a Horizontal Boring Mill.

New speed of operation . . . New standards of excellence of bored holes . . . New accuracy in milling . . . Automatic table retraction and repositioning dependable within .0002".

Many machines show 75% greater average daily productivity.

Write for Circular

DEVLIEG MACHINE TOOLS

DE VLIEG MACHINE COMPANY

450 FAIR AVENUE, FERNDALE (DETROIT), MICHIGAN

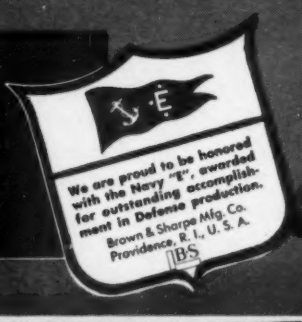
CORRECTLY SHARPENED CUTTING TOOLS LAST LONGER

Extend The Life Of YOUR Cutting Tools By Sharpening Them CORRECTLY On the No. 10 Cutter and Tool Grinding Machine.

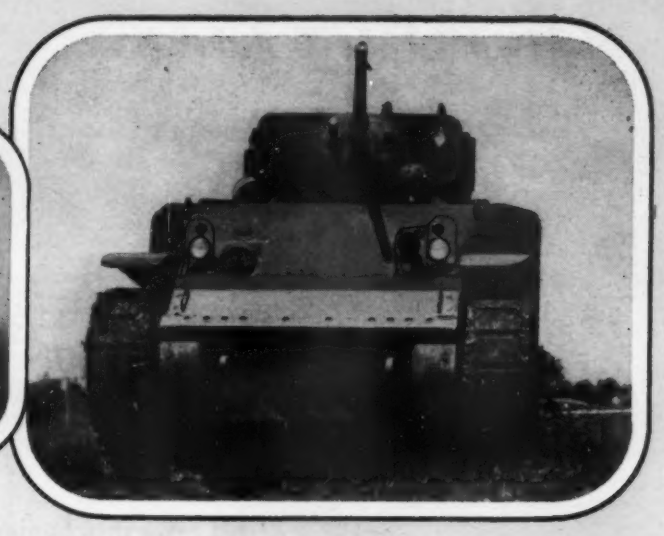
By sharpening *your* cutters and tools on a machine *built for the job* you will increase production — will stretch your tool dollars — and of great importance now, will conserve precious high speed steel.

The No. 10 is *built for the job* to give the best sharpening results—designed by us after years of experience in making and using all types of cutters.

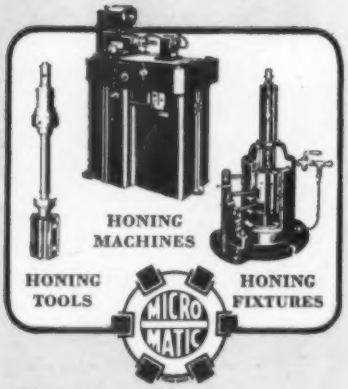
PROMPT DELIVERY ON No. 10 enables you to install the machine *now* — so as to get *immediate* advantage of its usefulness.


We are proud to be honored with the Navy "E", awarded for outstanding accomplishment in Defense production.
Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.
BS

BROWN & SHARPE



From plowshares to SWORDS
...TO PLOWSHARES



Micromatic

HONE CORPORATION

Detroit, Michigan

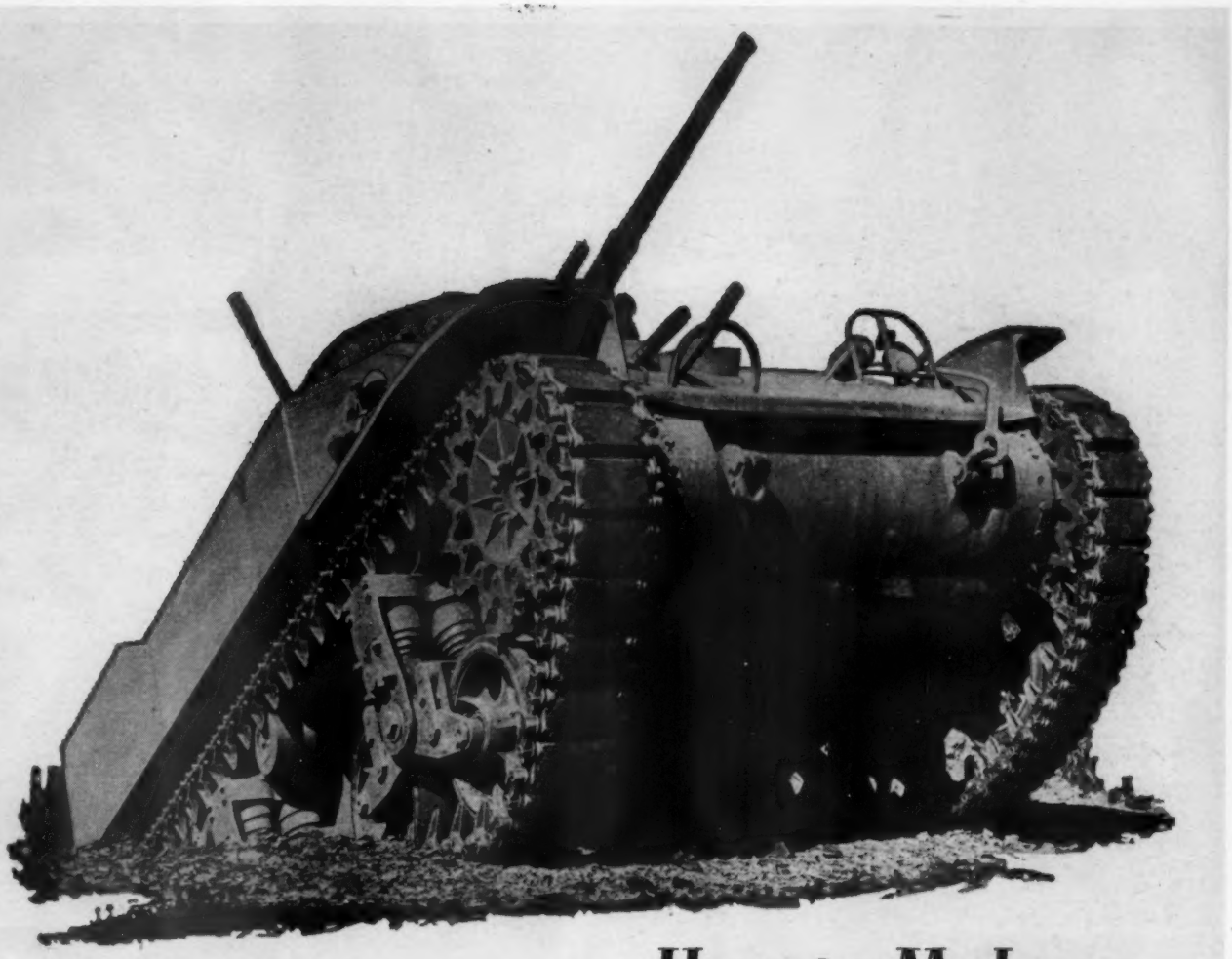
Yesterday—*The steam "traction engine" gave way to the gas powered crawler tractor just in time to suggest the World War I tank. It was only a crude, slow moving offensive weapon, but it promised tremendous tactical advantage. Only the use of early abrading processes made it possible.*

Today—That swift powerful engine of destruction—the modern tank—is the product of many years of combined experience in ordnance and automotive practice. Honing, the advanced abrading process, is of utmost importance in making possible this modern beating of "plowshares" into "swords".

Tomorrow—Our "swords" must again become "plowshares"—war developments always produce technological advances usable in peace. What these advances may be, we can only guess. But the fundamental process of Microhoning will be ready with new refinements to meet these needs.

This process which generates bore accuracy for roundness and straightness within .0002" to .0003"—which removes up to 65 cubic inches of stock per hour, has been developed into many ramifications, now being used for war machines. Tomorrow they will be available to speed peacetime production.

MAKERS OF HONING MACHINE TOOLS



How to Make a Sprinter out of a PILLBOX

Tons of metal—guns and ammunition—fuel—charging over a blasted landscape at 45 miles per hour—the "pill box" has become a sprinter in the modern tank.

Performance of this effective war machine depends on the modern engine power plant—the way it is designed and made. This engine must have amazing stability, durability—highest all around performance qualities. Yet it must lend itself to fastest maintenance or repair with minimum equipment.

Microhoning contributes largely to this result because it offers the most modern method of final precision stock removal and close control of surface character.

It provides a high degree of accuracy and any desired surface finish—*without* injurious frictional heat—*without* deformation of subsurface metal structure.

Without this close precision and controlled finish, modern tactical use of the tank would be impossible.

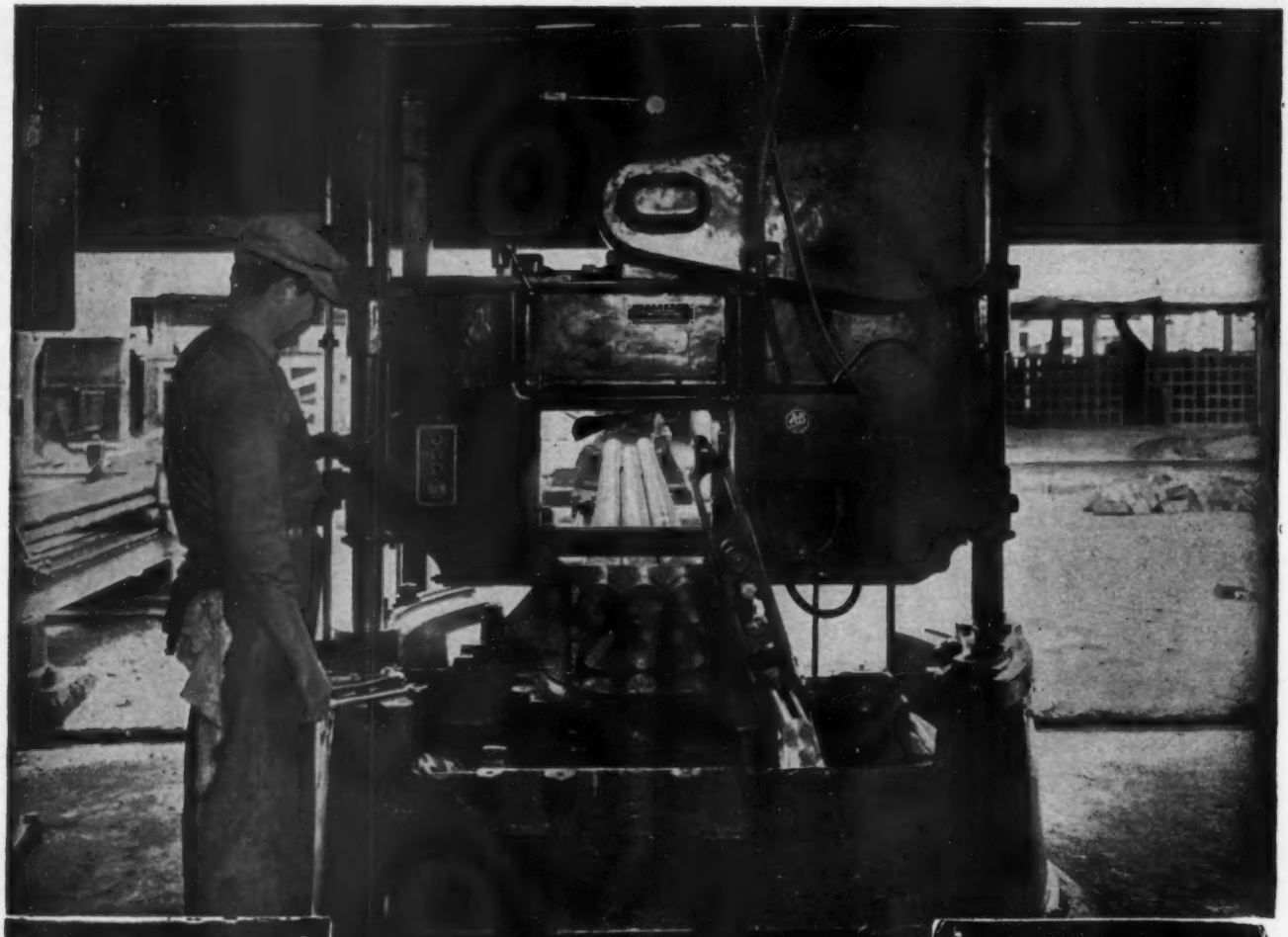
Some Microhoned Tank Bores

Gas and Diesel Engine Cylinder Bores and Sleeves • Connecting Rod Bores (Large End) • Valve Guide Bores • Diesel Fuel Injector Bores • Transmission Gear Bores • Gun Recoil Cylinders • Gun Predictor Hydraulic Cylinders • And Many Other Parts

MICRO MATIC

MICROMATIC HONE CORPORATION

DETROIT, MICHIGAN



MARVEL SAWS

Cut anything that will go between the jaws

This is one of five No. 18 MARVEL Giant Hydraulic Hack Saws used by a well known Texas tool company to cut-off "multiple bars of alloy steel in round, square, and flat shapes, up to the maximum capacity of the large work-throat (18" x 18").

These super hack saws are designed for the largest sizes, and toughest steels—up to 18" x 18". After a year's heavy duty service, when asked as to the effectiveness of these saws in solving the cutting-off problems at this plant, the mechanical engineer in charge reported them "very effective."

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave. Chicago, U. S. A.
Eastern Sales Office: 225 Lafayette St., New York

Precision Built Milling Machines Since 1888

KEMPSMITH

Shall our younger generation fight with gloves or machine guns . . . against a friendly neighbor or a deadly foe . . . in peaceful, back-yard surroundings or in blood-drenched battle fields? The answer depends on what YOU and I do on the production front. We must CONTINUE to produce vitally needed war equipment and supplies . . . in ever increasing amounts . . . to help the United Nations win the War. We dare not let them down. We must

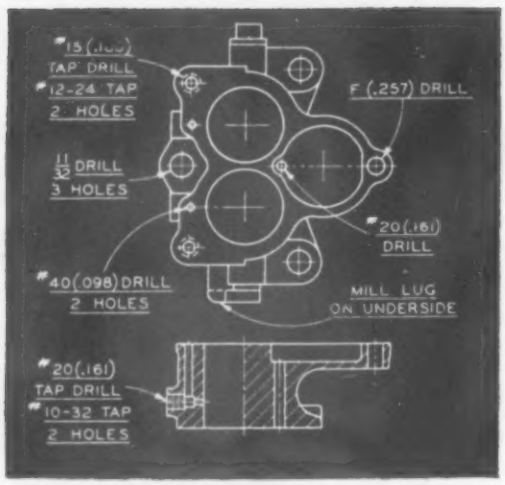
STAY ON THE JOB!

KEMPSMITH MACHINE COMPANY • MILWAUKEE 14, WIS., U. S. A.

FLEXIMATIC

The THRIFTY *Way*

To Solve Production Problems



Over a dozen operations on the carburetor throttle valve bodies shown — and Kingsbury FLEXIMATICS perform the entire job in a single chucking of the work! An example of the thrifty way to solve multiple-operation production problems.

FLEXIMATICS are built up of standard Units, set up on a standard base around an automatically indexing work-holding turret. This unit system of construction keeps first costs low—out of the "special machine" class. And in addition, FLEXIMATIC Units can be changed, moved around and mounted in any combination on the base to meet the machining requirements of many different parts. That is why we say that **flexible automatic** FLEXIMATICS are the THRIFTY way to solve production problems.

KINGSBURY MACHINE TOOL CORPORATION

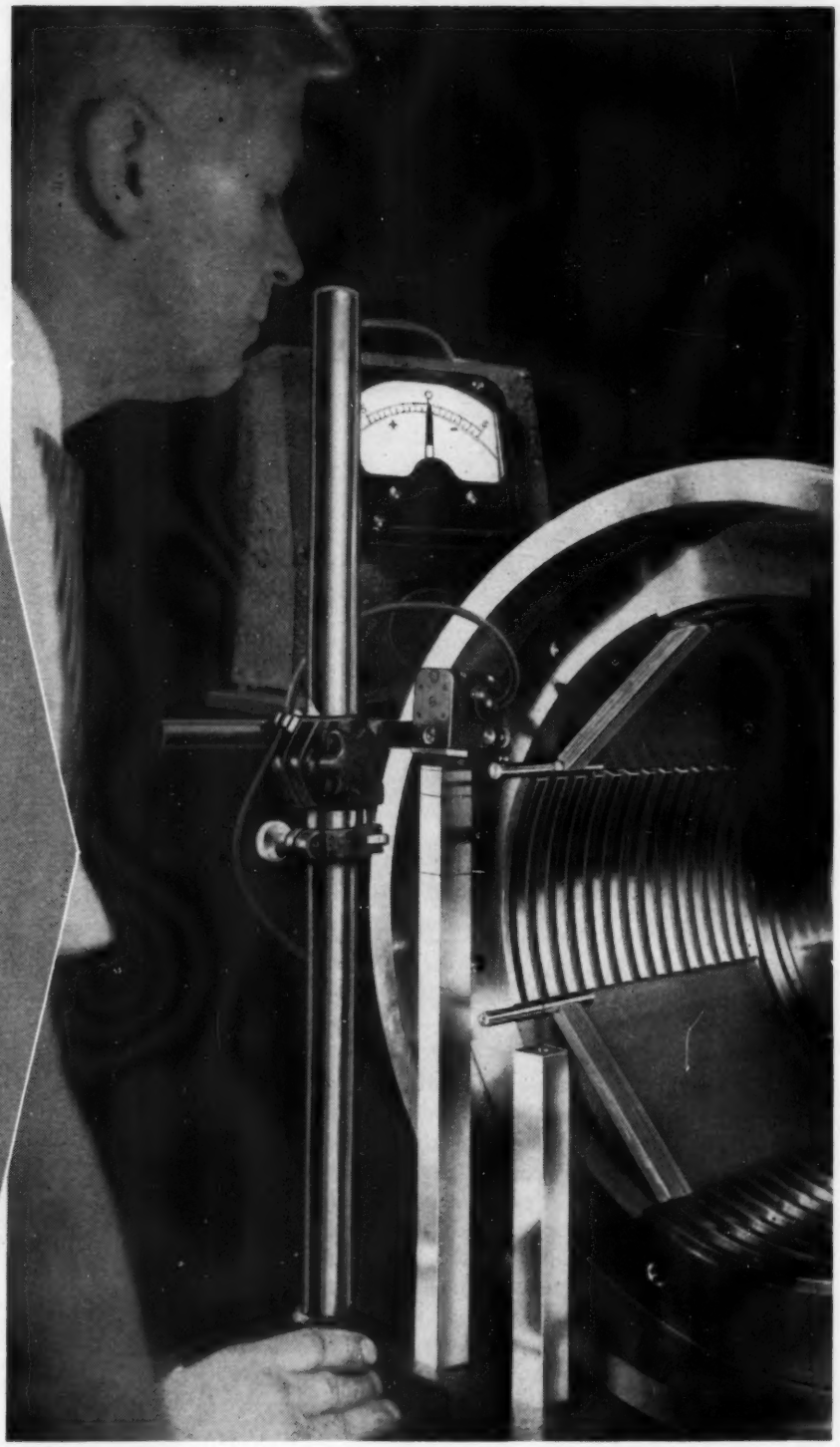
KEENE NEW HAMPSHIRE U S A

THROUGH ALL THE RUSH

One Fundamental Remains Unchanged

ACCURACY cannot be rushed . . . not the kind of accuracy that Pratt & Whitney has supplied to industry these past 83 years.

We know full well the desperate pressure and rush of war production . . . we've served faithfully through many of our country's wars. But never in any of these emergencies has the Pratt & Whitney standard of accuracy been sacrificed for speed. Enlarge our facilities . . . yes. Add and train thousands more men . . . yes. But lower our standard of accuracy . . . never. Through peace and war, Pratt & Whitney machine tools, small tools, and gages are made to one rigid standard of accuracy which has never changed.



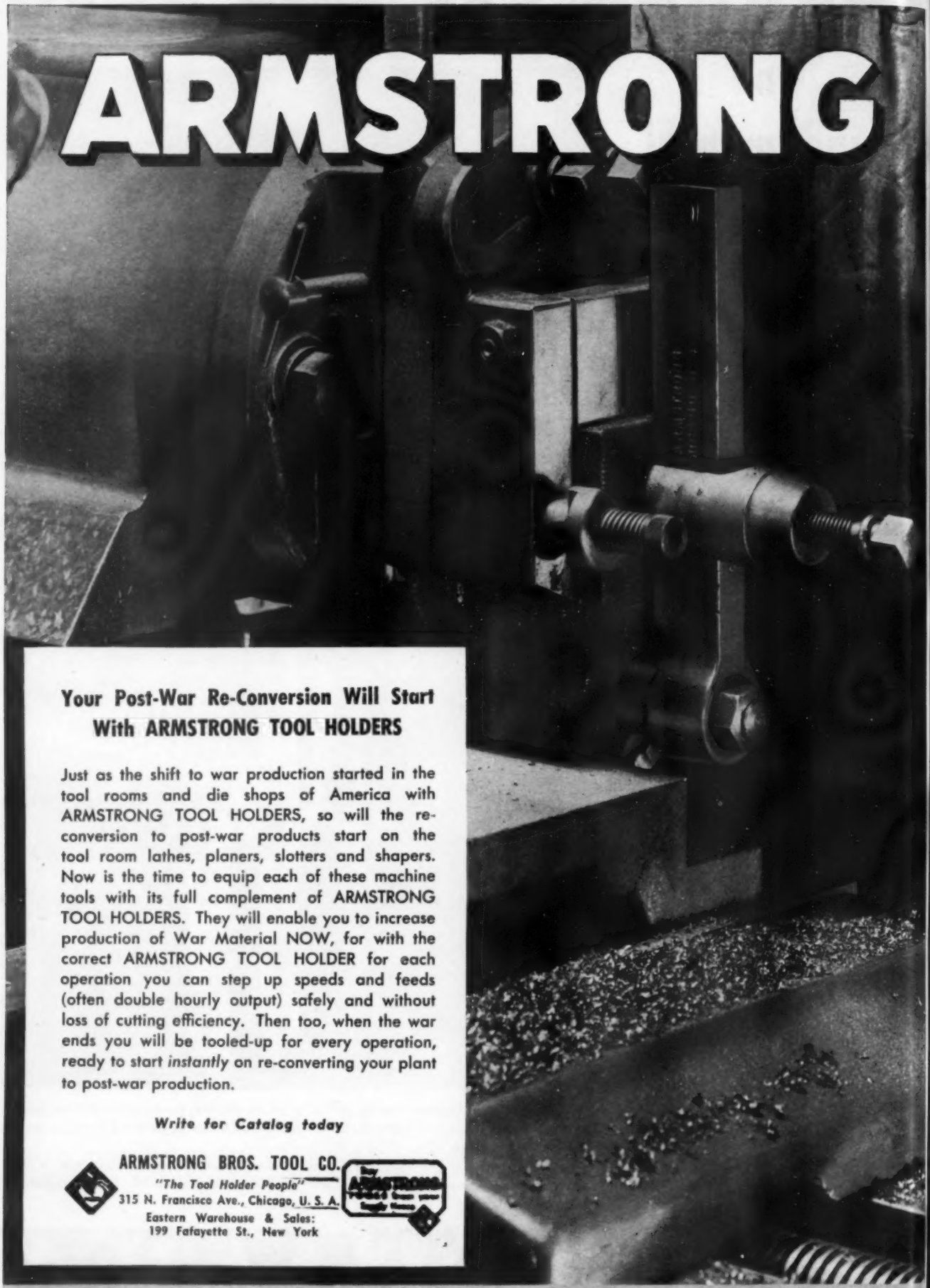
Accuracy — to millionths of an inch — at work on the war production front. A skilled craftsman uses a stack of P&W Hoke Precision Gage Blocks to check a vital point in a breech block gage.

Since World War I — when P&W pioneered and perfected the manufacture of these Hoke Precision Gage Blocks — they have steadfastly remained *the* basic standard of measurement.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT



Your Post-War Re-Conversion Will Start With ARMSTRONG TOOL HOLDERS

Just as the shift to war production started in the tool rooms and die shops of America with ARMSTRONG TOOL HOLDERS, so will the re-conversion to post-war products start on the tool room lathes, planers, slotters and shapers. Now is the time to equip each of these machine tools with its full complement of ARMSTRONG TOOL HOLDERS. They will enable you to increase production of War Material NOW, for with the correct ARMSTRONG TOOL HOLDER for each operation you can step up speeds and feeds (often double hourly output) safely and without loss of cutting efficiency. Then too, when the war ends you will be tooled-up for every operation, ready to start *instantly* on re-converting your plant to post-war production.

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315 N. Francisco Ave., Chicago, U. S. A.
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ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

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for

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RIGHT OR LEFT HAND

IMMEDIATE DELIVERY

METRO Standard Tools and Gages are available at once from stock. Cat. No. 101 features the complete line—write for your copy of this informative catalog today.

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Special Carbide-Tipped Tools to your prints is a METRO specialty. Let our engineers help solve tough machining problems.

★ METRO Standard Tools are tipped with general purpose grades for "UNIVERSAL" shop use in a majority of turning, facing, boring, and forming operations.

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CHICAGO, 30, ILL.

because they can be depended on for ECONOMY, EFFICIENCY *and* SPEED

All the essential performance qualities demanded in small tools today are met in UNION TOOLS.

Faster cutting, longer life between grinds, accuracy and all-round better performance of these tools are matters of common recognition in plants busy on war work where small tools are subjected to the most exacting service conditions.

You, too, can depend on UNION TOOLS for your requirements. Try them once and you'll use them regularly.

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Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies — Screw Plates — Profile Cutters.

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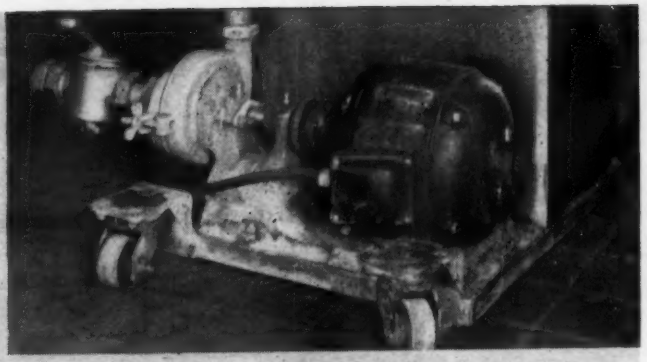
UNION

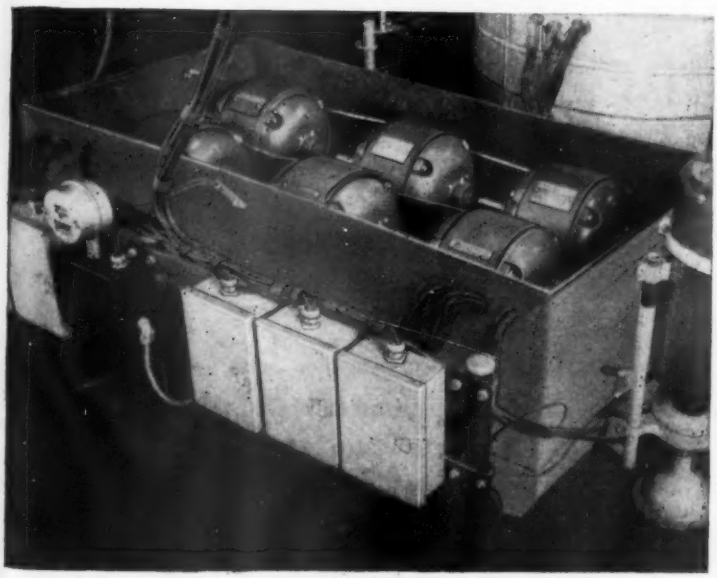
DOUSED DAILY!



G-E Tri-Clad motor coupled to a centrifugal pump on a portable cleaner in the milk plant of H. P. Hood & Sons, Inc., Charlestown, Mass.

POWERING A DAIRY PUMP, this Tri-Clad splash-proof motor gets a dousing every day as the plant is hosed down. After years of service, frame and end shields are virtually uncorroded, insulation is going strong. G-E "protection tests", both in the development of the Tri-Clad design and in our daily production, help us assure you of long-lasting service from Tri-Clads on motor-wracking jobs like this.

"Hot Box" at 100% humidity tests TRI/CLAD motor protection



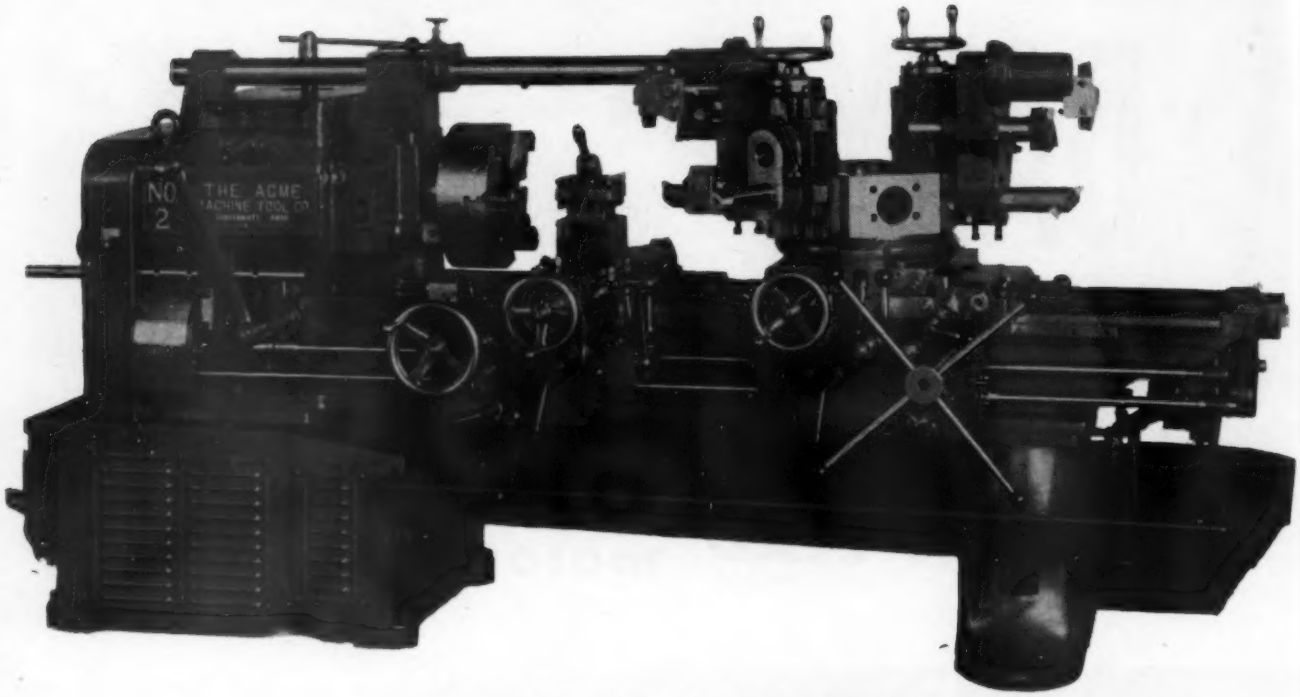
Here is one of the many development tests which helped to prove the *extra* stamina engineered into the Tri-Clad design. In the bottom of this moisture box, just below the motor base, two inches of water was maintained at 212 F. The cover kept the humidity within the box at 100 per cent. By operating motors in this atmosphere to the breakdown point, G. E. got the low-down on the coil insulation's moisture resistance. Tri-Clad motors, in both open and splashproof construction, showed up unusually well in this extra-severe test. *General Electric Company, Schenectady, N. Y.*

GENERAL ELECTRIC

TRI/CLAD MOTORS

Every week more than 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

THE NO. 2
ACME
TURRET LATHE



...A VERSATILE MACHINE
QUICKLY ADAPTABLE TO POST-WAR OPERATION

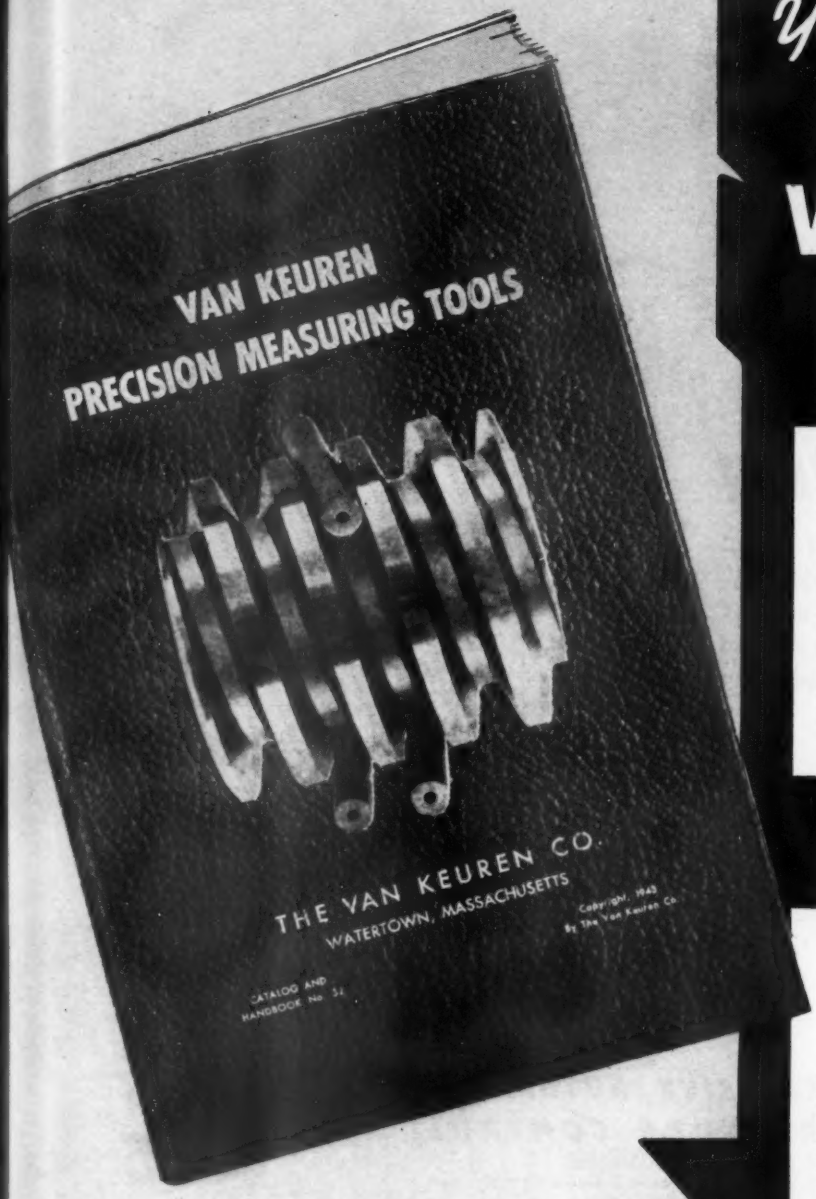
● The wide variety of work that can be handled on this machine — the ease with which it can be tooled for new work — makes it ideal for many of the jobs that are being planned now for future production.

Its sturdy, rugged construction assures ample strength and power for the high speeds and feeds required with carbide and other high production tools. Its compact design enables the operator to secure high production with minimum fatigue and to maintain close limits of precision.

The No. 2 machine shown has a 3½" round bar capacity and will swing 20½" over the bed.

ACME MACHINE TOOL CO.. ... CINCINNATI, OHIO.

Just off the Press!



Your Personal Copy of the NEW VAN KEUREN HANDBOOK *No. 32*

This new 144 page Catalog and Handbook is a highly useful manual in convenient reference form on precision measuring. It describes and illustrates methods and equipment for checking accuracy to hundred thousandths and millionths of an inch. Use of the Van Keuren equipment described in this new booklet has resulted in many outstanding improvements in production and product quality and in vastly simplifying the problem of attaining closest tolerances on work of all kinds.

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New Light Wave Equipment with fused quartz optical flats.
New solid square master blocks representing permanent accuracy.
New and complete gear measuring tables from 5 to 500 teeth.

ENGINEERING INFORMATION

How to measure standard and special screw threads.
Screw thread data includng tables of basic diameters and tap drill sizes for all American threads.
Thread proportions for American and Foreign threads.
Bureau of Standards measuring wire specifications.
How to measure helical gears.
How to measure angles.
How to use optical flats.
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25th Year

Ultimate Accuracy

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Kindly send me a copy of your NEW Catalog No. 32. It is understood this request incurs no obligation on my part.

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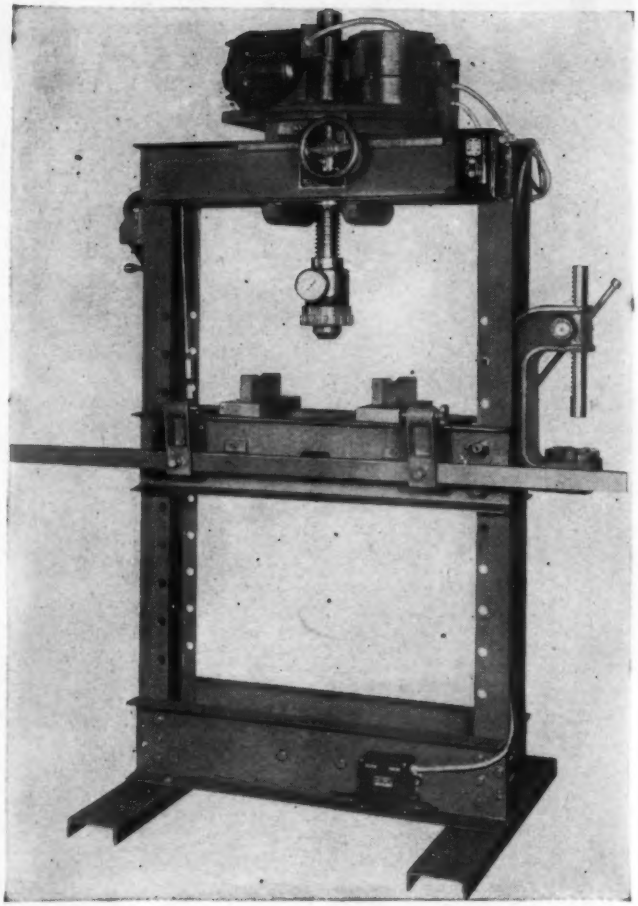
POWER PRESSES

CUT MAN-HOURS ON TANK PRODUCTION

They're press-fitting tank parts—plenty of 'em—faster, easier, better with automatic solenoid pressure controls. Foot pedal automatic control enables operator to exert an initial tonnage of any desired pressure and then increase pressure to any point up to maximum without backing ram of work.

- **DEVELOPS 60 TONS PRESSURE IN 4 SECONDS**
- **ADJUSTABLE BOLSTER**
- **FOOT PEDAL SWITCHES**
- **MOVABLE RAM HEAD**
- **CHOICE OF PRESSURES, RAM TRAVELS, AND RAM SPEEDS**

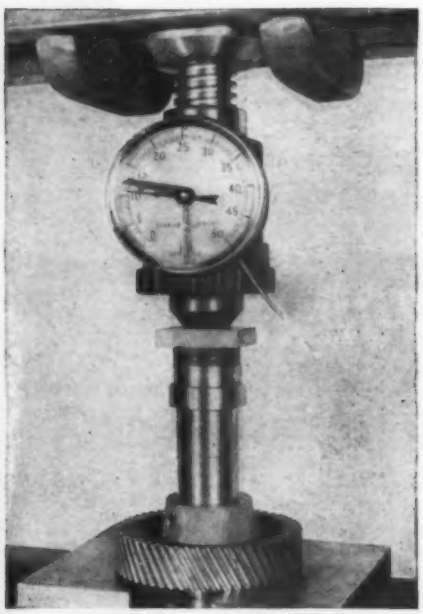


★ *HYDRAULIC AND ELECTRIC MODELS*

★ *40 and 60 TON CAPACITIES*

★ *PRE-SELECTED PRESSURE CONTROLS*

★ *GOOD DELIVERY!*



EXCLUSIVE AUTOMATIC PRESSURE CONTROL

With optional automatic pressure control operator simply sets the regulator hand on the dial guage to any pressure. When that pressure is reached, the power cuts off instantaneously and a solenoid operated magnetic brake stops the ram.

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TO
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There is a brighter side. From $319 in 1914, net income per capita in these United States climbed to $875 (est) in 1943. Increase in cost of living jumped 76% in the 1913-1918 period of War I. The first five years (1938-1943) of World War II show a climb of 24%. Close of 1944 may well see an accumulated "buying reservoir" of $100,000,000 in American socks. Your plant expanded for war. How about your vision? Has it expanded to include the "peacework" future? To turn a profit, then, calls for turning, now, from production at any cost to production at lowest cost. Look at your lathes, for instance. Then look to LeBlond.

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- ☐ HEAVY DUTY GEARED HEAD ENGINE LATHES
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- ☐ No. 2 CUTTER GRINDER

YOUR NAME _____ TITLE _____

YOUR FIRM _____ ADDRESS _____

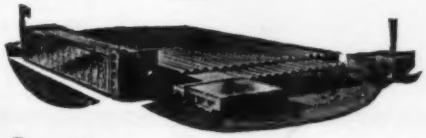
time to retool

Turn to Le Blond for Turning Equipment

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

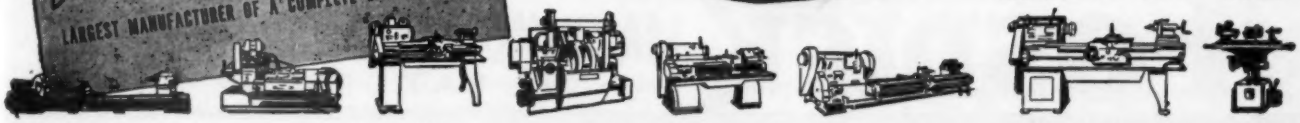
ARMY E NAVY

LeBLOND



★ YOUR BONDS BUY BOMBS ★

BUY A "BLOCK-BUSTER" TODAY!



HD Engine Lathes—Nine sizes ranging from 12" to 50" swings. For versatility in turning.

Automatic Lathes—12" & 16" Mechanical or Hydraulic power.

Super Regal Lathes—Six sizes, 13" to 24" Best for training.

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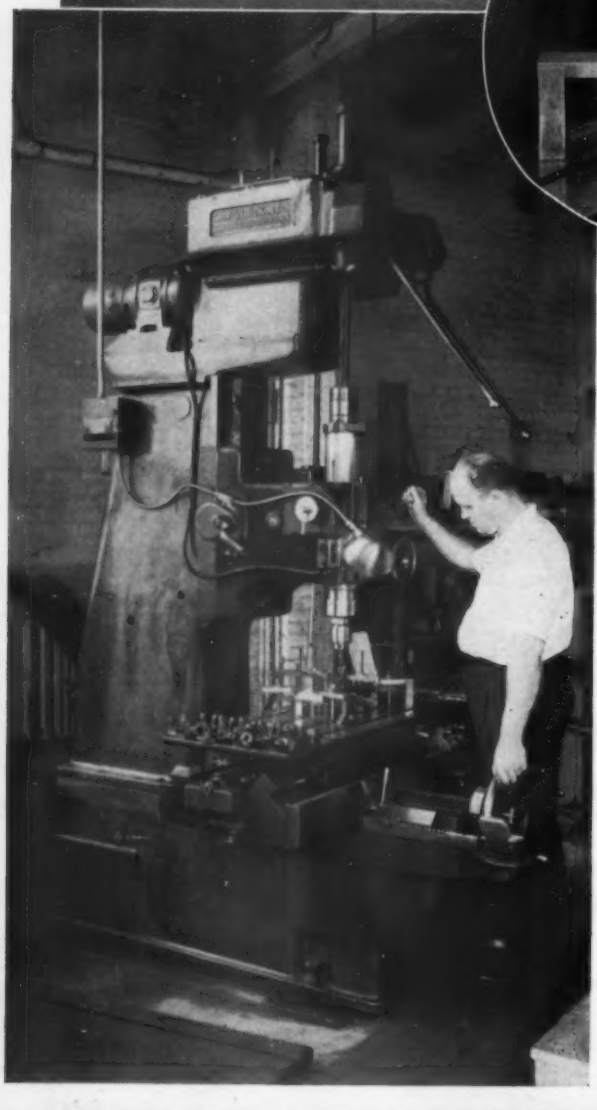
No. 2 Cutter Grinder—Internal, cylindrical, face and angular work.

Simplifies

PRECISION DRILLING, BORING AND TAPPING OPERATIONS

FOSDICK *Jig Borers*



• The Fosdick Jig Borer is ideal for handling a job of this type which requires drilling, boring and tapping operations on a limited number of pieces. The piece is an "Indicator bracket for a ball bearing radial looseness gauge". Set-up is as follows: A sub-plate is mounted on the table containing two bored pin holes, one of which is used to locate from central hole by means of a pin. Four holes are bored and three screw holes spotted in this position. Then the sub-plate is mounted on an angle plate and a second pin inserted into one of previously bored holes. Two more holes are then put in the work at right angles to the first ones and location is determined from the two dowel pins.

Operations performed — Drill 2 — .250" dia. holes, 1 — .625" dia. hole — 1 — .498" dia. ⅞" deep hole and 3 center drill spots — 2nd operation — Drill 1 — 17/64" dia. hole — tap ¼" dia. hole #20 tap — 2 — 5/16" dia. holes #18 tap in line.

Fosdick Jig Borers have gained a wide reputation in tool rooms — tool shops and in production shops where accuracy and flexibility are essential to rapid production at low costs.

Consult a Fosdick Engineer on your work and the possibilities for handling it more economically on a Fosdick Jig Borer.

Full details of construction — operation — and application are found in Jig Borer Bulletin — J.B.A. Write for yours.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, · · · OHIO

"Massaging" white-hot steel with the aid of G-E electronic tubes
G-E STEEL-JACKETED IGNITRONS CONVERT A-C TO D-C EFFICIENTLY AND ECONOMICALLY

HERE's an eight-inch billet getting a "massage" that will reduce its square waistline and shape it into a roughly streamlined gun-barrel. The manipulator which feeds the billet under the hammer — back and forth, round and round — requires D-C power for this precision operation. Sturdy G-E sealed ignitrons supply the power.

These steel-jacketed electronic tubes have no moving parts, are quiet in operation; over-all efficiency is high and practically constant over the entire load range. Available in ratings from 20 amp to 200 amp, they convert A-C into D-C economically and reliably. Rectifiers using the G-E sealed ignitrons for D-C power at 250 volts or more generally will have about the same installed cost, but lower operating costs than a motor generator set. *Their use permits D-C power to be economically applied to "production spots" where D-C motor drives are essential even though you have an A-C power distribution system throughout the plant.*

The steel-jacketed ignitron is only one of a complete line of G-E electronic tubes now working for industry on innumerable jobs and many kinds of machinery. It is the purpose of the G-E electronic tube engineers to aid any manufacturer of electronic devices in the application of tubes. Through its nation-wide distributing system, General Electric is also prepared to supply users of electronic devices with replacement tubes.

"HOW ELECTRONIC TUBES WORK"

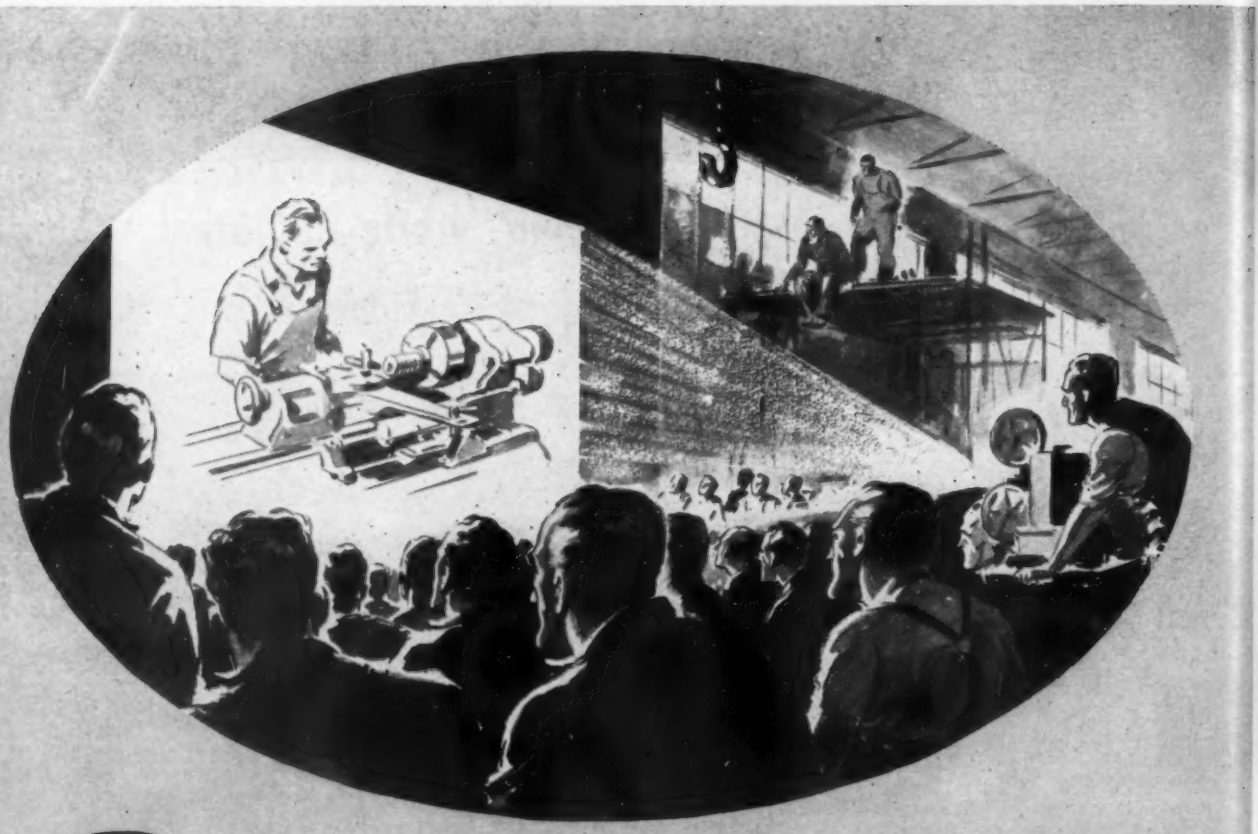
THIS BOOKLET will be mailed to you *without charge.* Its 24 pages are interestingly illustrated and written in easily understood language. Shows typical electronic tubes and their applications. Address *Electronics Department, General Electric, Schenectady, N. Y.*

• *Tune in* "The World Today" *and hear the news direct from the men who see it happen, every evening except Sunday at 6:45 E.W.T. over CBS. On Sunday listen to the G-E* "All Girl Orchestra" *at 10 P.M. E.W.T. over NBC.*

G.E. *HAS MADE MORE BASIC ELECTRONIC TUBE DEVELOPMENTS THAN ANY OTHER MANUFACTURER*

GENERAL ELECTRIC

162-C1



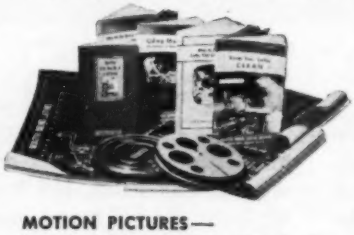
Speed the Training OF NEW LATHE OPERATORS

Skilled manpower is one of the most critical of all war industry problems today. To replace the thousands of skilled machinists called to the services, new and inexperienced men and women workers must be trained to carry on the battle of production.

To help with the training of new lathe operators, South Bend offers a complete training program of sound films, reference books, manuals, wall charts, and bulletins. These represent an authoritative and effective course in lathe operation and modern shop practice. The 16 mm color, sound films have been adapted from South Bend's well known reference and text book, "How to Run a Lathe," now in its 42nd edition.

We are pleased to offer these films and instructional literature to industries and schools conducting pre-employment training classes.

WRITE FOR INFORMATION ON THESE PRACTICAL TRAINING HELPS



MOTION PICTURES—
"The Lathe" and "Plain Turning"—two 16 mm sound films in color on lathe operation. Available on a free loan basis for apprentice training. Showing time 20 minutes each. Write for Circular No. 8-A.

HOW TO GET THE MOST OUT OF YOUR LATHE—
Specialized service bulletins on the care and operation of engine lathes. H-1, "Keep Your Lathe Clean"; H-2, "Oiling the Lathe"; H-3, "Installing and Leveling the Lathe"; H-4, "Keep Your Lathe in Trim." Sample copies mailed on request.

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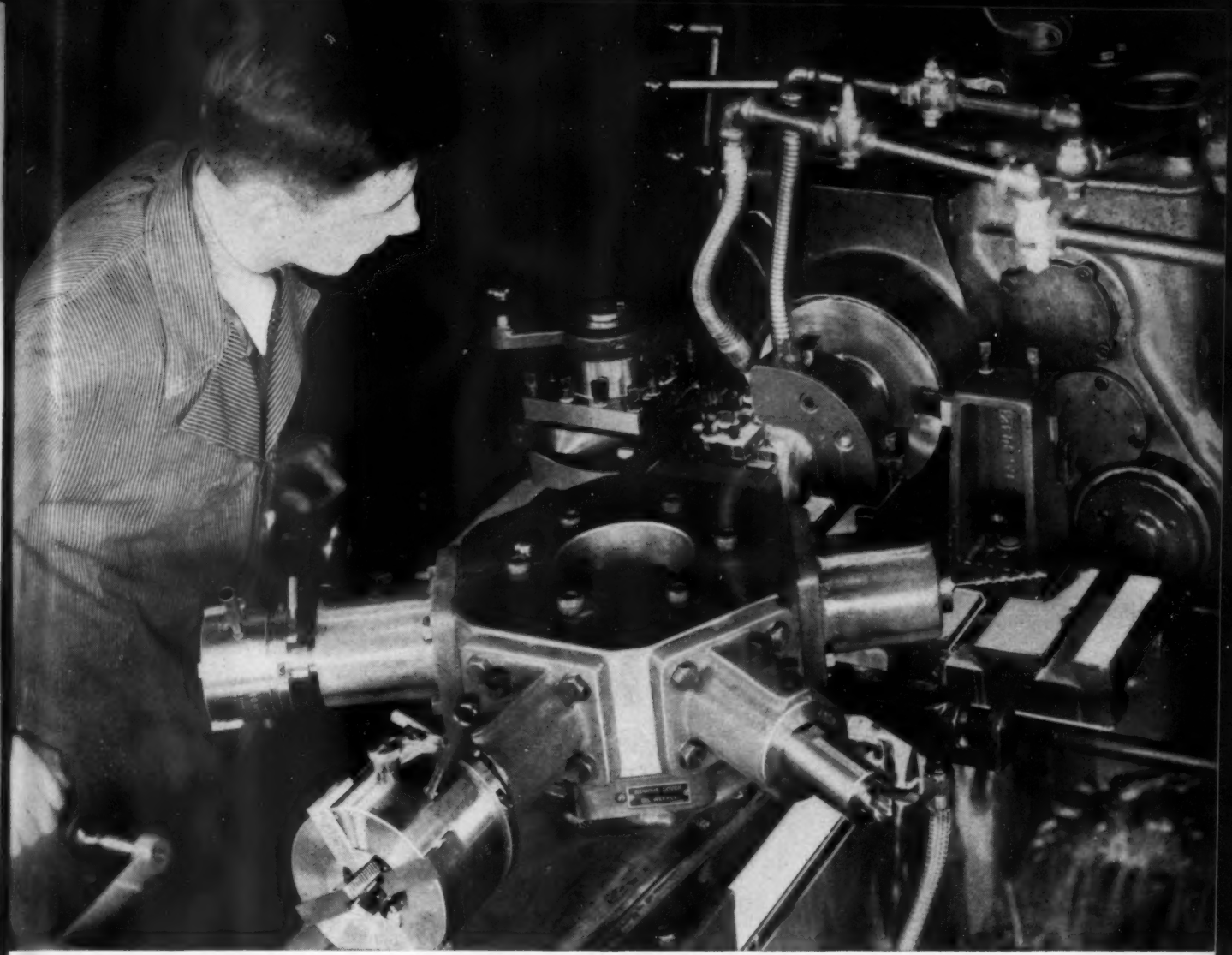
THREAD CUTTING—
21-page book, "How to Cut Screw Threads in the Lathe." Shows how to set up a lathe for cutting various pitches of screw threads, setting cutter bits, screw thread formulae, metric threads, etc. Price 10c. Sample copy free to apprentice supervisors.

GRINDING CUTTER BITS—
12-page book on grinding lathe tool cutter bits. Covers identification and application of various bits, methods of grinding, correct angles, etc. Price 10c. Sample copy free to apprentice supervisors.

BUY WAR BONDS!

SOUTH BEND LATHE WORKS · Lathe Builders for 37 Years · South Bend 22, Ind.

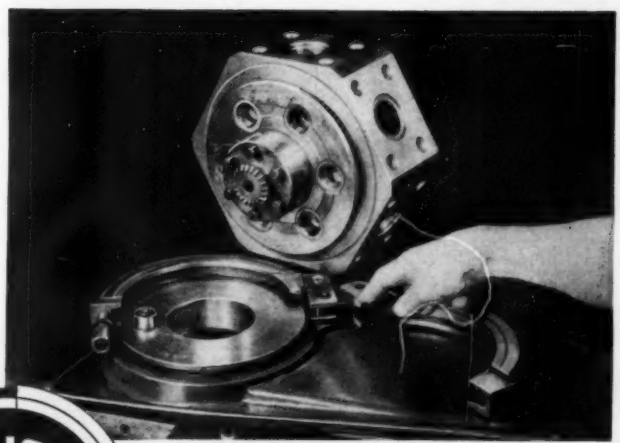


WORK GOES *FASTER...*

with Gisholt's Automatic Turret Indexing and Clamping

A turn of the pilot wheel is all it takes to withdraw the hexagon turret on a Gisholt Ram-Type turret lathe—and to unclamp and index it to the next position. As the slide again moves forward to approach the work, the new turret face, accurately located square with the spindle, is automatically clamped in rigid cutting position. To complete the entire cycle, the operator doesn't take his hand from the pilot wheel.

The automatic indexing and clamping provided by Gisholt is the most efficient known on a turret lathe. It makes turret lathe operation simpler and easier. It speeds war production, *now*—cuts costs *anytime.*



The tapered steel locating pin and bushings are hardened and ground to assure accuracy for the life of the machine. The double beveled clamp ring, operated by a powerful eccentric toggle, relieves the locating pin of all strain in taking heavy cuts.

GISHOLT MACHINE COMPANY
1201 E. Washington Ave. • Madison 3, Wisconsin

Look Ahead—Keep Ahead—With
Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

MEET YOUR POST-WAR PRODUCTION DEMANDS WITH Firthite!

FIRTHITE SINTERED-CARBIDE PUNCHES AND DIES WILL GIVE YOU:

Better Product

Less burring, distortion, and buckling; more uniform accuracy; better finish—smoother edges and surfaces.

Longer Life

Edges stay sharp longer; resist chipping and breaking. Life multiplied many times!

More Production

Less idle time for changes.

Greater Economy

Lower cost of maintenance; fewer resharpenings than any steel dies.

Firth-Sterling

STEEL COMPANY

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

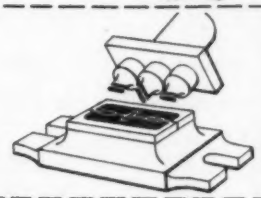
Makers of High-Speed Steels, Tool and Die Steels, and Sintered Carbides

FIRTHITE PUNCHES AND DIES FOR:

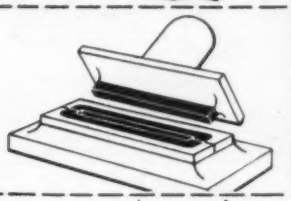
★ PERFORATING

★ BLANKING

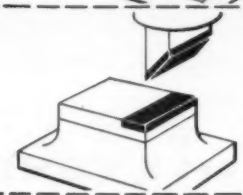
★ SLOTTING



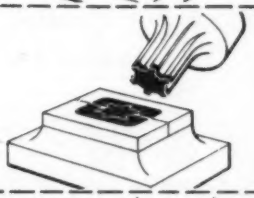
★ SLITTING



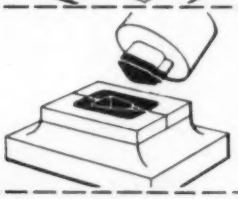
★ CUTTING OFF



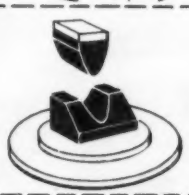
★ SHAVING



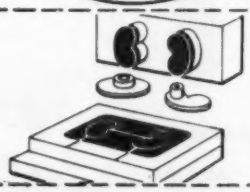
★ NOTCHING



★ FORMING OR BENDING



★ TRIMMING



also laminating, burnishing, curling, piercing, crimping, planishing, broaching, swaging, etc.

Please furnish this information when you request quotation on Firthite Punches and Dies:

Assembly blue print of present method;
Detail blue print of existing punches and dies;
Description of material punched;
Type of press (full details);
Type of die holder, sub-plate details, etc.

ARMY E NAVY

Firth-Sterling
STEEL COMPANY
Offices: McKEESPORT, PA. NEW YORK - HARTFORD
PHILADELPHIA - CLEVELAND - DAYTON - DETROIT
CHICAGO - LOS ANGELES

BIG

little things with

JOBS

Ultra smoothness and extreme accuracy in the mechanical world mean more efficient operation, more dependability, longer life.

It is the *forte* of honing and superfinish stones to create ultra smoothness and extreme accuracy; to create those physical attributes far beyond the capacity of anything else man has yet contrived.

MID-WEST MICRO BOND honing and superfinish stones have blazed many new trails in the field of superb finishes and extremely close tolerances. Many of Uncle Sam's weapons of war—tanks, guns and planes—owe a portion of their deadly efficiency to a MID-WEST honing or superfinish stone often smaller than a match. Truly such tiny items are little things with big jobs!

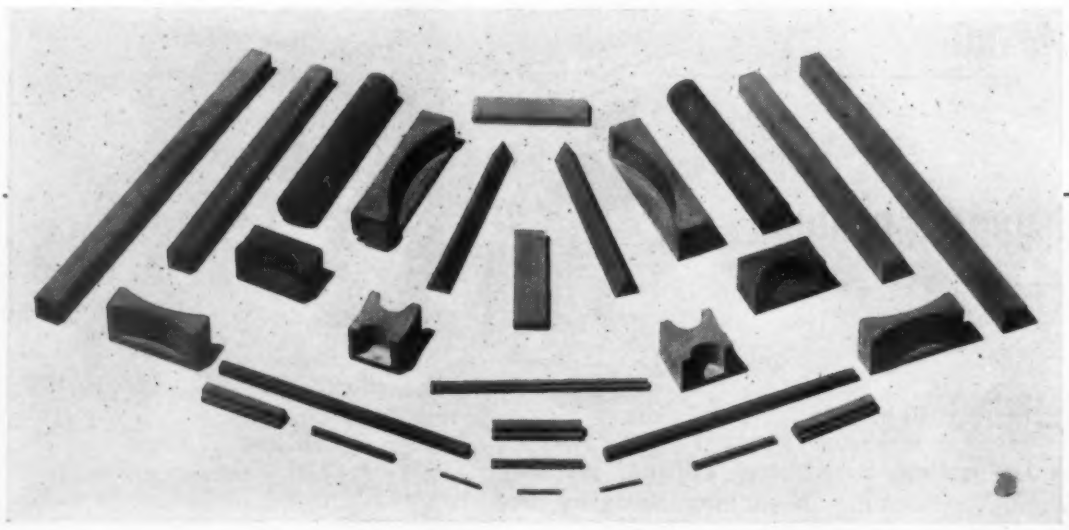
MID-WEST honing and superfinish stones—*the world's most efficient abrasives*—come in any size, any shape, any grain, any grade. They last longer, cut faster and produce smoother surfaces with less heat.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. Milwaukee Avenue Detroit 11, Michigan

MID-WEST'S complete line of abrasive products also includes grinding wheels for any purpose, coated abrasives of any type and compounds. Let a MID-WEST service engineer tell you what MID-WEST abrasives have done for others. You'll be amazed!



A 35-SECOND RECIPE FOR CLUTCH PLATES

Any housewife, just enlisted in war work, can understand this!

Take the rough casting for an 8" clutch pressure plate and place in the chuck of a Gisholt Hydraulic Automatic Lathe. Start machine and let run at 400 r.p.m. with .005" feed for 35 seconds or until machine automatically stops. Remove finished plate which is ready to serve on a jeep.

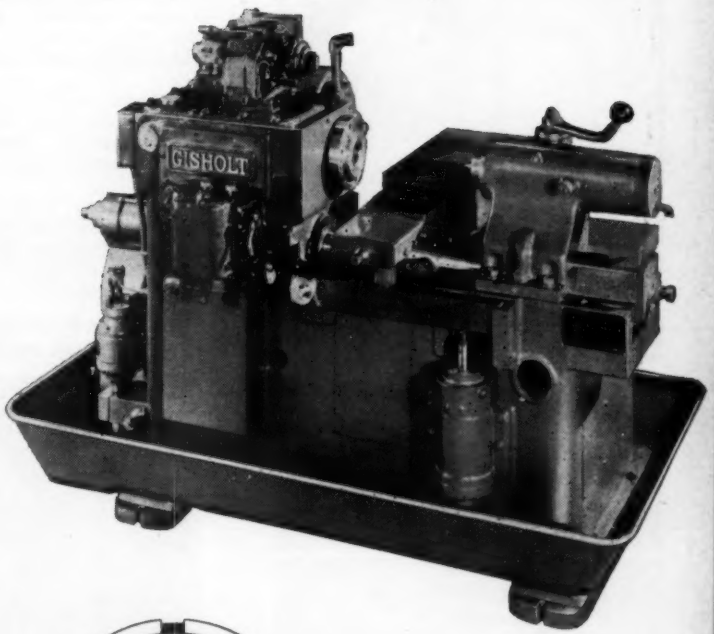
It's as simple as that with the Gisholt Hydraulic Automatic Lathe. And it's typical of the way many inexperienced workers are producing a wide variety of parts quickly and accurately to meet the demands of war production.

Gisholt engineers are ready to help you apply the speed and simplicity of the No. 12 Hydraulic Automatic Lathes to your own specific problems in large volume machining. Write for complete information.

GISHOLT MACHINE COMPANY

1201 E. Washington Ave. • Madison 3, Wisconsin

Look Ahead—Keep Ahead—With
Gisholt Improvements in Metal Turning



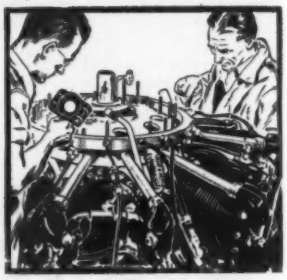
GISHOLT

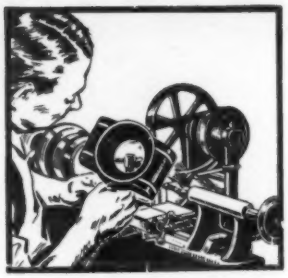
THE GISHOLT HYDRAULIC AUTOMATIC LATHE *is adaptable to a wide variety of between-centers and chucking work. It provides high speed multiple cutting with extreme accuracy. One operator usually tends two or three machines.*

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

MAGNI-RAY

aids accuracy, saves time and quickly detects trouble—an instrument of wide utility





MAGNI-RAY — a wide field, illuminated magnifier for close inspection of tools, work and operations — gives clear, undistorted magnification combined with strong concentrated illumination.

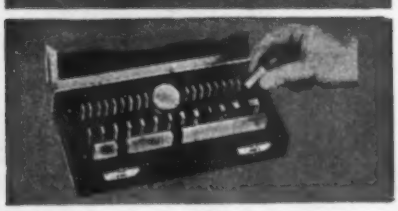
In addition to the typical uses shown here, MAGNI-RAY provides an effective, simple means of reading micrometers down to one-tenth graduations as well as verniers, accurately and clearly.

Developed to meet the many needs in the shop where eye aid can promote accuracy and speed operations, MAGNI-RAY increases personal efficiency in tool room, inspection, drafting, assembly. Because it is an instrument of almost countless uses on precision work of all kinds, it meets many definite needs.

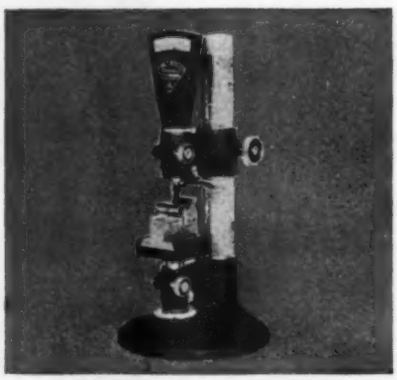
MAGNI-RAY MODEL A — with 3 inch optical glass lens, complete with two bulbs, electrical equipment, swiveling clamp and stand— Price $18.50. MAGNI-RAY MODEL B — with achromatic lens magnification field of 2 inches and magnification power of 3 plus, complete with bulbs, electrical equipment, swiveling clamp and stand — Price $27.50.

Speed Your Inspection by Ordering Today!

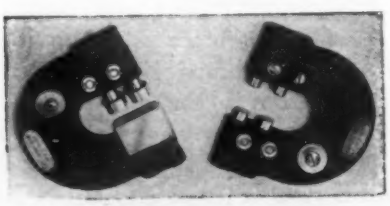
OTHER INSTRUMENTS IN THE SCHERR LIMITED BUDGET INSPECTION LABORATORY



Ultra-Chex—a 34 block set accurate to .000008" and providing a basic standard of measurements.



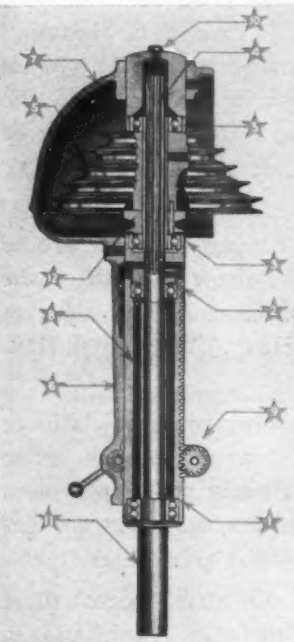
Scherr Comparitol — for checking gage blocks, gages and work for size, accuracy and wear.



Atlantic Adjustable Limit Snap Gages —for accurate check-up, without having to depend on operator's skill. Sizes to 6".

GEORGE SCHERR COMPANY, INC. 124 LAFAYETTE ST., NEW YORK, N.Y.

Why Industry Prefers THE WALKER-TURNER 20" DRILL PRESS!



1. Double row ball bearing — for thrust and radial load.
2. Ball bearing near spindle center aids rigidity.
3. Ball bearings above and below pulley eliminates whip.
4. Ten spline spindle improves accuracy.
5. Aluminum alloy spindle pulley permits speeds above 5000 r.p.m.
6. One piece head casting, bored in line.
7. Pulleys and belt amply guarded, yet easily available.
8. Steel quill turned from bar, seats bored and rack milled in quill.
9. One piece feed pinion and shaft, with teeth cut on gear hobber.
10. One-shot lubrication — oil applied at one point only.
11. No. 2 Morse Taper Spindle Nose.
12. Power feed take-off pulley. Feed coordinated with spindle speed.

The sectional view above illustrates the careful design that provides an unusually smooth-running spindle in Walker-Turner 20" Drill Presses. These rugged production machine tools are in use in great numbers in war industries today. Due to their versatility, many have been applied in special tooling set-ups of various kinds. Simplicity of controls permits their use by unskilled and semi-skilled labor — an important point under present conditions as well as in the post-war period.

Send for descriptive literature

WALKER-TURNER CO., INC., 4524 Berckman Street, PLAINFIELD, N. J.

Furnished in bench, floor and multi-spindle models — with or without power feed. Capacity ¾" in steel, 1" in cast iron. Spindle speeds 260 to 2600 r.p.m.

walker-Turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

— then he said to himself

"TIME DOES NOT WAIT"

"THE foe cannot be beaten," says Joseph Stalin, "if his forces of today, fully developed to the utmost, are opposed by forces of tomorrow . . . TIME DOES NOT WAIT."

So, by having recourse to the forces of tomorrow TODAY . . . he makes NEWS . . . he achieves TRIUMPHS . . . he dictates HISTORY.

"Developing tomorrow's force TODAY" can well be the motto hanging in every conference room where factory committees are discussing postwar procedures.

And under that motto these words: "Our ship, tank, plane, weapon industries are TODAY working with tomorrow's greatest forces for production. Come re-conversion to peacetime products, they are in practiced strategy to outproduce and underprice all competitors who have the temerity to go into postwar production with day-before-yesterday's techniques."

"Even if you had the time—don't wait for time."

"TIME DOES NOT WAIT"... *he says*

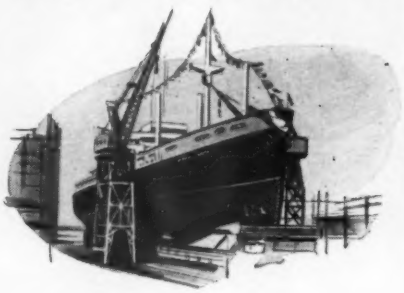
Look, Mr. Stalin, how through *recourse to Arc Welding* you can tweak time's forelock.

Similar time savings gave you tomorrow's force today.

Arc Welding, of course, will not win the war for you . . . but lack of Arc Welding could have lost it for you.

And that thought might well be another motto for each postwar planning room.

DAYS instead of MONTHS



Easily the margin between Victory and defeat—for you and the United Nations—is putting ships on the water *6 times faster*.

LAST WAR "Liberty" size ship 300 DAYS
THIS WAR they average under 50 DAYS

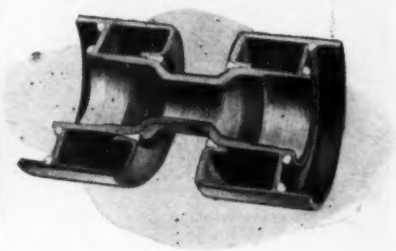
Recourse to Arc Welding in 2 years has put to work 2000 more ships than possible under old standards—thus saving the necks that Old Methods would have lost—yours and ours.

Think *that* one over!

HOURS instead of WEEKS

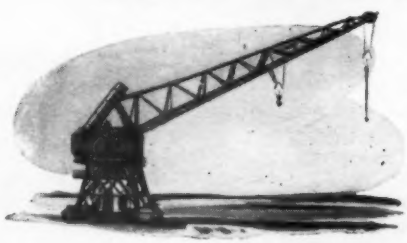
A sit-down in a steel plant lasting for weeks would be a headline SCREAM in Pravda and every newspaper in the world. That catastrophe was averted by *recourse* to Arc Welding when these six welders repaired the break of a vital steel mill part in 8 hours. Replacement would have taken weeks . . . thus sabotaging the output of a hundred war producers. Think that one over too—in terms of providing *recourse* to help in trouble.

MINUTES instead of HOURS



Half-track parts at half-time speed . . . these are typical of machine parts which *recourse* to Arc Welding helped rush to first and second fronts. Processing cost cut from $11.00 to $6.64. Machining cost cut from $3.50 to $1.25. Weight cut from 27½ to 24 lbs. Time cut 45%. This cutaway picture is to help you think over what *recourse* to Arc Welding will do to the cost of any part of any of your machines.

MINUTE-MEN of production cut MAN-HOURS on every job



This 28-ton revolving crane which literally gives the *lift* to America's ultra-speedy shipbuilding industry—gets to the job 1,584 MAN-HOURS SOONER through *recourse* to Arc Welding.

FABRICATED . . . 23.5% FASTER
ERECTED . . . . . 21% QUICKER
than by riveted construction.

THE LINCOLN ELECTRIC COMPANY • Cleveland 1, Ohio

America's greatest natural **recourse**

ARC WELDING

THOUSANDS OF GAGES

READY FOR *Rush* ORDERS

CADILLAC *Thread Plug* GAGES

ALL STANDARD SIZES
National Fine . . . National Coarse
0-80 to 1½-6
Also Pipe Plug Gages—⅛ to 1¼

TO GET any standard size Thread Plug Gage does not involve waiting for weeks, months, or even days—if you order from Cadillac. Whatever sizes you order are on their way to you IMMEDIATELY.

Quick shipment is an advantage we have because of the fact that, being specialists in the manufacture of this type of gage, we always carry a stock that numbers well up into the thousands.

If required, within a few minutes of the time your order is received, the gages you need can be ready to leave by air express from the Detroit airport which is located right near-by.

CHECK UP
ON YOUR REQUIREMENTS
AND
WIRE YOUR ORDER
TODAY!

CADILLAC THREAD GAGES CADILLAC

CADILLAC GAGE COMPANY, *Detroit*

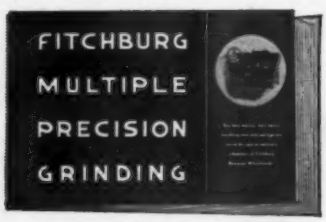
WHAT ABOUT *TOMORROW'S GRINDING COSTS?*

You can cut tomorrow's costs with the Fitchburg Grinders you buy today.

Fitchburg low cost method of mounting standard Bowgage Head Grinding Wheel Units for special single applications, or to multiple grind special jobs, will give you faster wartime production at lower cost, and leave you in a position to make rapid changeovers when the present emergency is over.

All Fitchburg Bowgage Head Automatic Precision Grinding Wheel Units are standard. They can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.

Save time and money — speed up cylindrical production grinding with Fitchburg Bowgage Heads.



This Book shows how to cut grinding costs. . . . Free to executives. . . . Write for it today.

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

TOOLS LEAD A DOUBLE LIFE

SUNICUT

increases tool life 100%... improves finish of parts

Tools can't take a holiday . . . not when there are guns to make, and bombers to build, and other war material to produce. But tools were taking holidays . . . far too many . . . for regrinding and resharpening at one of the largest mid-west war plants.

Production quotas were a headache to machine tool operators and foremen because the frequent "time-outs" for tool changes cut down the output. In addition the finish of the parts was not up to par. Many grades and brands of cutting oil were tested and tried, but all failed to correct the condition. So they called a Sun Doctor of Industry — a cutting oil expert — who studied the problem and recommended a change to Sunicut, the transparent, sulphurized oil.

Tools double parts produced for tool grind on many operations before they need changing . . . and the finish of the parts is everything that could be desired. Sunicut succeeded where the others failed.

Output is stepped up in this war plant because the high heat-absorbing and metal wetting properties of Sunicut permitted longer tool life and finer finish. How about investigating the production-boosting possibilities of Sunicut in your plant? A Sun Oil Engineer will be glad to discuss it with you. Write

SUN OIL COMPANY • *Philadelphia 3, Pa.*

Sun Oil Company, Ltd., Toronto, Canada

SUNOCO

SUN INDUSTRIAL PRODUCTS *HELPING INDUSTRY HELP AMERICA*

THE CINCINNATI BICKFORD TOOL COMPANY, OAKLEY, CINCINNATI 9, OHIO

FEBR

MARINE DIESELS

are produced for new Victory Ships under noteworthy efficiency at the Nordberg Manufacturing Company plant, through whose courtesy this photo was obtained. The setup illustrated —showing a Super Service Radial in action—calls for a number of operations on Diesel engine beds. Six cored holes around each crankshaft bearing are drilled, reamed and backfaced . . . similar operations are performed on four cored holes between finished ends. Some of the holes are as large as 4" dia. by 23" in length; all are within close tolerances—attesting to the capacity, accuracy and convenience of the Super Service Radial in heavy duty war production.

Cincinnati-Bickford

SUPER SERVICE RADIAL

ARMY E NAVY

THE CINCINNATI BICKFORD TOOL COMPANY, OAKLEY, CINCINNATI 9, OHIO

"Postwar Planning"

TOO many companies today are using the ostrich technique—"if you don't see unpleasant facts, they aren't there".

An unpleasant fact in industry is that thousands of American plants are carrying the high-cost burden of out-of-date machine tools but will have to compete, after the war, with foreign and domestic plants tooled up to the minute. War with three-shift production has blinded many businesses to that truth; the competition that is coming will bring it out into pitiless light.

But managers who intend to survive are doing something about it, *now*. Working with Warner & Swasey engineers, they are planning their postwar turning departments, with modern Warner & Swaseys that will bring costs down to meet competition, and so broaden markets and offer job security. *And they are placing their orders now* for the delivery of Warner & Swaseys as soon as priorities permit.

WARNER & SWASEY
Turret Lathes
Cleveland

YOU CAN TURN IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

What's in This Issue

BUOB

Curtiss-Wright used a program of mystifying, tantalizing advertisements, slogans painted on floor and parking spaces, dinner rallies, nationwide radio broadcasts and a schedule of credits leading to awards of gold and silver pins and the granting of certain privileges, to bolster employee morale. The six-months program, built around the slogan "Back up Our Battleskies," cut absenteeism sharply. The Curtiss-Wright plan has a lot of interesting and effective angles and the article commencing on page 83 rates as important reading for persons responsible for keeping manpower at its peak.

Racks Speed Spraying

Spray painting of small parts for Pratt & Whitney engines has been speeded as much as 2000 percent at the Ford Aircraft Engine Plant through the use of specially designed racks with integral masks. On page 87 you'll find the racks described and pictured.

Mighty Manipulator

Faced with spending a total of 24 hours to manipulate a weldment that required but 26 hours actual welding time, Nordberg Manufacturing Company designed and built a manipulator capable of handling three-ton air scavenger heads and thereby attained a 48 percent cost saving. Harold E. Bailie, welding supervisor of that company, has written of the development and construction of this manipulator and you'll find this article by turning to page 94.

Jig Bushing Standard

Page 91 is devoted to a discussion of the proposed revision to the two-year-old American Standards Association standard on jig bushings. The shortcomings that have been discovered in this standard are touched upon and suggestions of improvements are invited.

The Brush Off

Precision parts are being finished by brushing wheels with consequent speeding of production and satisfactory mechanical results, we learn from an article by R. O. Peterson, manager of technical department, The Osborn Manufacturing Company, starting on page 97. To expedite production many new applications and types of brushing wheels have been devised and some metal-working plants are using them extensively in their finishing operations. Mr. Peterson tells the considerations surrounding the selection of brushing wheels and describes many applications.

Ring Breakage Stopped

Wilton F. Hoag details the steps taken by a producer successfully to overcome breakage of header die rings during the third drawing operation for 40-mm. shell powder cases. Starting on page 115, it's part of the Armament Section.

A. AINSWORTH

Knurling Knowledge

Methods of doing various types of knurling on screw machines, and proper knurling toolholders to use for each, are parts of an article by A. Ainsworth, general foreman, Screw Machine Division, The McKinnon Industries. It starts on page 88.

Bombsight Development

Some of the most closely guarded secrets of the Allied war effort have been on bombsights. Though extremely complicated and necessarily built to a high degree of precision, several types have been coming off of U.S. production lines at an encouraging rate since early in our war effort. Typical of the development and production has been that which AC Spark Plug Division applied to the British T-1 computor type, and the story is given in detail in The Armament Section. Page 105.

Machine Tapers

The Reference Book Sheets of this issue present Parts III and IV of a four-part detailing of the American Standard for self-holding and steep tapers.

There Are Better Ways

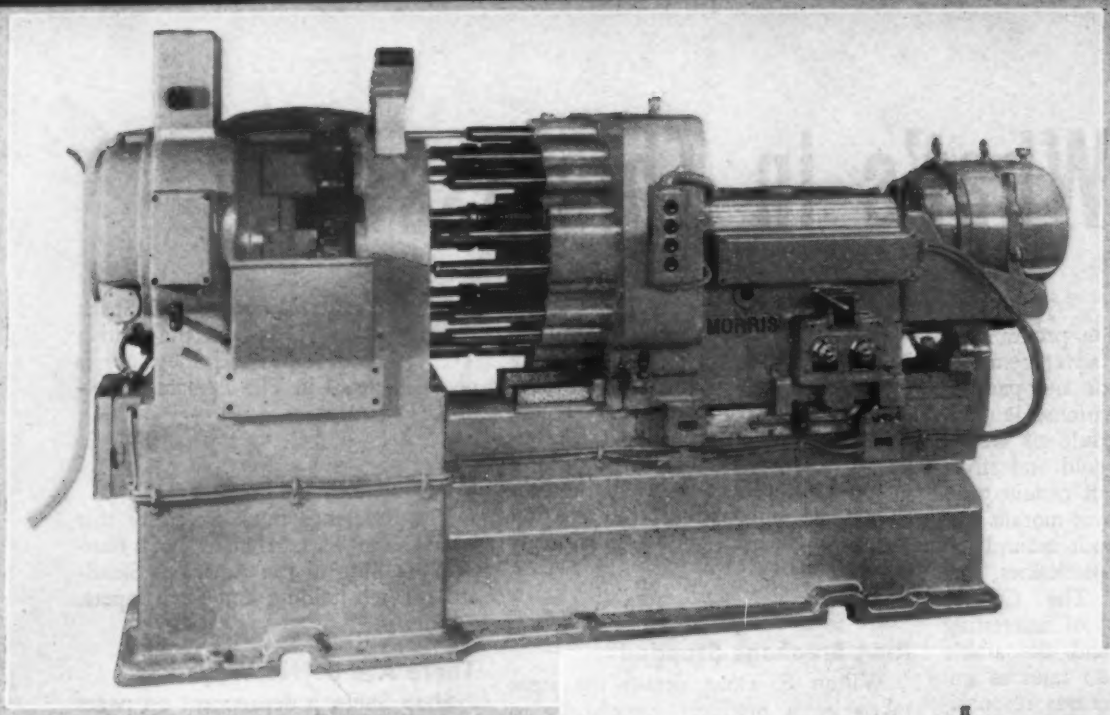
Shop Shots, a department on pages 92 and 93, is devoted to a series of time and money saving ideas that have proven of value in aircraft plants. Illustrated and described in captions, they range from portable gage testing apparatus which save time and material, to spring attachments to hold rivet sets in pneumatic guns and a specially constructed load bar which speeds movement of partially completed Liberator bombers on the assembly line.

COMING

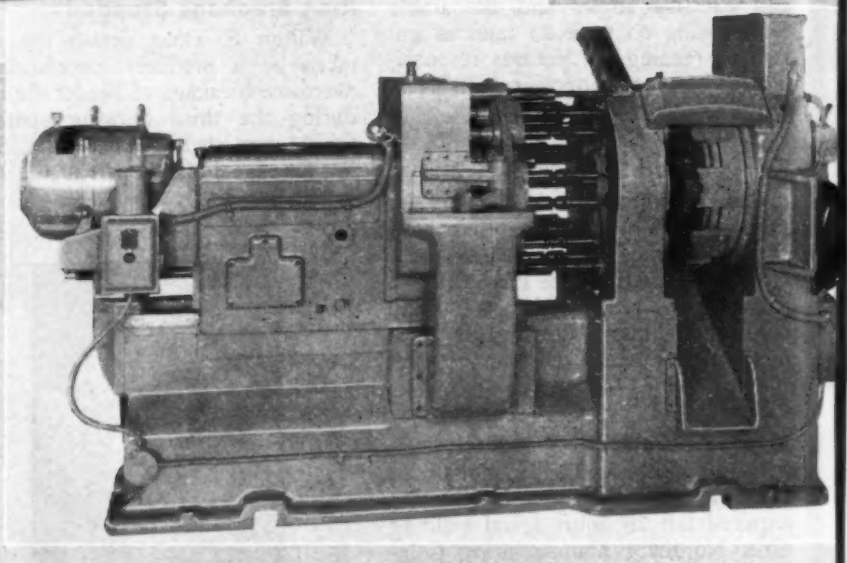
By conveyorizing the assembly, forging and machining lines of its new 250-lb. demolition bomb plant, Mechanical Handling Systems, Inc., reduced scrap loss to between 0.25 and 0.35 percent, speeded production, cut costs and made possible the hiring of more women. The details of this story make one of the important articles in an early issue.

During three war years, South African industrial development has leaped forward the equivalent of 25 peacetime years, while employment in metalworking plants has more than doubled. This has resulted from a combination of South African resourcefulness and American and British aid in the form of tools. A soon-to-be-published article will detail this development and indicate the postwar possibilities of the area.

To reduce consumption of cutters for milling fins inside Pratt & Whitney pistons, Chevrolet engineers analyzed the job, developed a new, cheap cutter that saves vital material, gives more pieces per grind, and can be made by production methods in the toolroom. The details will appear in a future issue.



MORRIS BUILDS MACHINES *to specific job requirements*

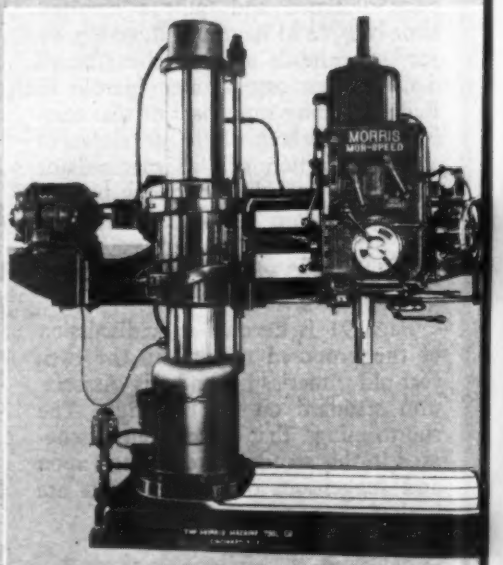


● In addition to its line of Mor-Speed Radials Morris engineers — design — and build special machines to specific job requirements.

The horizontal drilling machine shown is typical of the special equipment built by Morris to meet an individual requirement.

This machine drills—reams—counterbores and hollow mills the end of valve guide bushings. A horizontal self contained hydraulic feed unit operates the 14 spindles. Loading and unloading is accomplished automatically by gravity. Clamping and unclamping of fixtures and indexing is automatic.

If your plans call for drilling — reaming — boring — facing or similar operations consult Morris Engineers on your high production work requiring special equipment.



Morris Mor-Speed 13" column Radial, one of the Radial Drill family

Builders of MOR-SPEED Radials

The MORRIS Machine Tool Co

CINCINNATI, OHIO

American Machinist

ESTABLISHED 1877 • BURNHAM FINNEY, EDITOR

A PRODUCTION SOLDIER'S PLEDGE
TO OUR ARMED FORCES
To Every Man in Every Branch of Our Armed Forces
I Solemnly Make This Pledge
I will do my best with my time, my tools, my skill and my dollars to provide you, in quality and quantity, the support in the air that your spirit and bravery have already proved you so richly and rightly deserve.
Thus will I, as a production soldier
BACK UP OUR BATTLESKIES
NAME DEPT. CLOCK NO.

This is the pledge to our armed forces, which workers signed voluntarily at the opening of Curtiss-Wright's war production drive

Curtiss-Wright Drive Boosts Employees Morale

BY BENJAMIN W. CORRADO, ASSOCIATE EDITOR, AMERICAN MACHINIST

IN SIX MONTHS, Curtiss-Wright successfully reduced absenteeism and labor turnover by an elaborate war production drive which elicited worker cooperation along all lines desirable to any management. The drive was designed to increase production through:

1. Maximum effort.
2. Decreased absenteeism.
3. Developing time- and material-saving suggestions.
4. Greater punctuality.
5. Recruiting new employees.
6. Minimizing waste of time and spoilage.
7. Reducing tool breakage.
8. Stepping up quality.
9. Promoting better health.
10. Decreasing accidents.

To cover all this ground, the program needed considerable planning. Thus, Curtiss-Wright first studied war production drives going on in many plants, drew from them the best thinking on the subject and then added many original ideas from its own labor-management groups. The result was the "Back Up Our Battleskies" campaign expected to inspire worker cooperation in correcting problems retarding production because: (1) It did not suggest driving tactics either by labor or management; (2) It made workers a vital part of the war effort; and (3) It asked them to perform their patriotic service in connection with their production of planes.

Launching the Campaign

The campaign was launched early in April, 1943, with provocative material posted throughout the company's seven plants. Teaser initials "BUOB" featured the display, appearing on posters with the message "Be a 100% Production Soldier—BUOB," and also being painted on plant floors, passageways, and parking lots. Plant loudspeakers helped the mystery along.

With employee curiousity at its peak, big dinner rallies were held in five cities on April 11 (a Sunday, thus not interrupting production), featured by a nationwide broadcast about which employees had been told in advance. Since the company could not accommodate all of its 70,000 employees at its dinners, attendance was limited to worker and foremen aides (one each to every major department), company executives and plant officials, the suggestion committee, the labor-management war production drive committee, and distinguished guests. The New York dinner was attended by Charles E. Wilson, of WPB, William Green, of the AFL, and James B. Carey of the CIO.

The radio program included a play starring Edward G. Robinson, terse comments by government and military officials, the explanation that BUOB meant "Back Up Our Battleskies," introduction of a campaign song bearing this title, and an outline of the "Back

One of the many displays throughout the company's seven plants, explaining to workers how they can become a "100% Production Soldier." Plant broadcasts, circulars, and articles in the company paper also highlighted the campaign

This poster was especially designed to curb worker absenteeism because of the urge to go shopping around the holidays. Other posters were timed for the hunting and fishing season, for baseball games and other special events, tending to tempt workers away from the job

Up Our Battleskies" plan. Every worker was urged to become a "100% Production Soldier" by signing a pledge to our armed forces, and accumulating certain credits entitling them to silver and gold "100% Production Soldier" pins, and certain privileges.

The next morning, workers found the plant decorated with new posters, banners, and painted signs on plant floors and parking spaces, bearing the slogan, "Back Up Our Battleskies." Brief messages about the campaign were conveyed over plant broadcasting systems, well spaced between interesting recordings. Incidentally, the broadcasting systems deserve much of the credit for the success of the drive.

Meanwhile, worker and foremen aides began signing up the workers for the drive—less than 1 percent failed to sign. Each pledgee received a "Production Soldier" plastic pin. To become a "100% Production Soldier," he had to maintain a 98 percent or better attendance for six months and accumulate 100 points or more by this means:

	Points
100 percent attendance with doctor's certificate for absences	40
100 percent attendance, no absences	60
Suggestion accepted by labor-management committee	40
Award for production ideas	40
Washington certificate for production ideas	60
Citation for production ideas	100
For being a blood donor	20
For war bond payroll deductions	40
For 10 percent or more war bond deductions	60

The "100% Production Soldiers" gained membership in the Curtiss Century Club, whose members enjoyed special privileges such as bowling alleys, tennis courts and parking space reserved for their use, family get-togethers, and so on. In addition, winners of silver pins received first consideration for promotions.

Besides this competition among individual workers, the plan pitted entire departments and plants against each other. The plant making the best monthly showing became entitled to fly the president's flag for the next month. Inter-departmental competition was split up into three categories depending upon the number of employees, and the departments showing the best monthly record in each group displayed a "We Are On The Job" flag for the following month.

At the outset, licking absenteeism was the nub of the campaign. Actually, lowered employee morale due to monotony of the work, fatigue, failure to appreciate the importance of the job, and similar factors usually lie behind most absenteeism, labor turnover, material waste, loitering, etc. Thus, Curtiss-Wright depended upon sustained interest in its campaign to help curb all plant ills, although individual drives pointed up each plant failing which actually aided the Axis.

At the end of six months, enough man-hours were gained by reduced absenteeism throughout the company's plants to build 31 twin-engined transports, 96 dive-bombers, or 294 fighter planes. Here is the record by plants:

Plant No.	Absentee Rate At Start of Drive	(Percent of Scheduled Man-Hours) Six Months Later
1	11.8	8.4
2	8.1	6.3
3	7.5	5.7
4	4.3	4.0
5	Research Laboratory—not involved	
6	3.3	3.3

The record of plant No. 6 compares favorably with normal peacetime absenteeism rates, and is close to the irreducible minimum.

Posters for the absenteeism drive were especially timed. At the opening of the fishing or hunting season, posters warned against taking time off for these reasons pointing out, "In the 'service' they're deserters—Don't be a production slacker." Besides coping

with seasonal temptations, posters and cartoons pointed up the triviality of almost every imaginable cause for absenteeism in relation to the winning of the war. Scoreboards were set up featuring an American plane headed toward Tokyo with the plane's movement dependent upon the attendance record, and the urging, "Work every day! Get that plane to Tokyo. When you're absent you aid the Axis."

Absentees without leave when returning had to fill in special absence reports on the AWOL cards inserted in the time clock racks. Brief messages over the broadcasting system, articles in the employee newspaper, and special booklets and folders stressed the importance of staying on the job.

The Columbus plant boosted worker incentive for perfect attendance by awarding *Helldiver* dive-bomber rides to 15 employees each month in a lottery among those workers with no absences for the preceding month.

Besides appealing directly to employees not to be absent, the campaign tried to head off the causes of absenteeism, such as lack of sleep, improper nutrition, illness, or accidents during off-hours. Even beyond that, the company established a nursery to care for children of working mothers to end this excuse for absenteeism. Since the nursery was never filled to capacity, it was apparent that the excuse, "caring for children," had been unwarrantedly used on many occasions before the nursery was built.

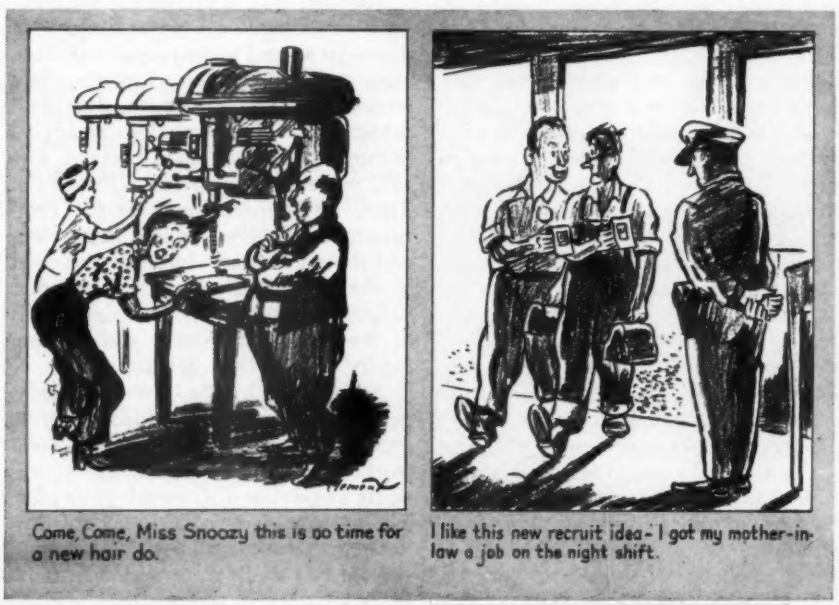
But underlying these efforts was the fact that an employee required a 98 percent attendance record to become a "100% Production Soldier." The importance given to this problem by the company is indicated by the fact that three individual drives, lasting four weeks each, were devoted to this subject. Other drives on production, suggestions, safety, quality, recruiting new employees, and buying war bonds were usually limited to a one-week or four-week duration.

With their sequence depending on the most pressing problem of each plant, each drive was spaced two weeks after the end of the previous one, thus giving the new objective more momentum than if it immediately succeeded the objective of the drive just ended. Betwen drives, patriotic posters were displayed aimed against loose talk, tardiness, and stressing health, safety, and saving tools and materials. Humor was frequently used, especially in the "Chick Sale" type of series aimed at reducing loitering in washrooms. Other posters featured statements made by Axis leaders and generals casting aspersions at Americans.

At the outset of the over-all campaign, its one phase not accompanied by an immediate drive was the suggestion system. The reason was the fear that a formal drive might deluge the company with suggestions and inability to handle all of them promptly might irritate and antagonize those making suggestions. Thus, the suggestion system was started quietly by setting up suggestion boxes and a labor-management group to act on suggestions.

Collected weekly, the suggestions were turned over to the labor measurement department which assigned an investigator to the scene of operation. Analysis of investigation results were then submitted along with the suggestion to the labor-management committee. Suggesters were promptly notified whether their suggestions was adopted, turned down, or required fur-

A plant official showing two executives of another company the scoreboard used in many departments of the Curtiss-Wright plants during the campaign to appeal to perfect worker attendance. The department's attendance record determined the length of time it took to get the plane on its scoreboard to Tokyo


Come, Come, Miss Snoozy this is no time for a new hair do.
I like this new recruit idea - I got my mother-in-law a job on the night shift.

Cartoons such as these were widely used in plant newspapers to remind workers of various special drives by the ever-pleasant medium of humor

Fred John Gravemann, punch press set-up man, is shown with the small stock guide and holder attachment used with punch press dies, which won him honorable mention from the War Production Board. This is only one of the thousands of suggestions the company received as a result of its suggestion campaign and many of these ideas proved highly valuable. Gravemann's suggestion increased the production rate by 117 percent

ther study. The labor measurement division was advised of accepted ideas so that it could put them into operation as promptly as possible.

For adopted suggestions cash awards were paid, depending upon their production value, while notices of acceptances were carried by the plant newspaper and the suggestions bulletin board. Twenty-one days after a suggestion was put into effect, its results were checked and, if outstanding, the suggester received an "Award of Individual Production Merit." Moreover, successful suggestions were passed on to Washington for possible national citation.

Many Suggestions Received

During the first six months, the Buffalo plant received 2700 suggestions, 23 of which were forwarded to Washington. The St. Louis plant with over 5000 suggestions led all aircraft factories in the nation with 31 national honors received from the War Production Board for employee suggestions. In other industries, the St. Louis plant ranked sixth among 3000 plants.

Some of the outstanding suggestions included: (1) a multiple plating rack to chrome-plate eight tail wheel plungers simultaneously, thus resulting in an 80 percent time saving and a 500 percent production increase; (2) a beading guide attachment, reducing production time from 6.2 min. to 36 sec., and eliminating distortion caused by the old method; (3) a punch-holder used in making holes in sheet metal parts, improving quality, reducing scrap, and saving over 500 man-hours of labor a year.

Besides the production value of suggestions, the suggestion committee also considered its indicativeness of the suggester's ability for other work, warranting transfer to another department. Even complaints that the system brought forth, as all suggestion systems will, were constructively utilized by personal interviews eliminating such grievances. Moreover, valuable non-production ideas were received on health, safety, posters, contests, maintenance, transportation, and so on.

The safety drive was featured by use of the gremlin idea. An explanation of the gremlins preceded the drive, while its opening was marked by a parade through the plant of midgets and children dressed as gremlins. During the drive displays warned workers the gremlins would hurt them unless they were careful, while articles in the company newspaper and leaflets stressed safety first. Departments making the best weekly showing in safety displayed a hanged gremlin with the sign, "We got the gremlins by the neck." After the safety drive, the accident frequency rate in the St. Louis plant fell from 10.2 to 7.77, and the severity figure from 0.94 to 0.53; the Buffalo plant cut its accident frequency by 25 percent below comparable 1942 levels; Columbus reported a 40 percent drop in frequency from March, 1943 to October, 1943.

Quality Improved 37½ Percent

The quality drive was featured by displays stressing to workers that they should not hide errors, because "Hidden Errors Cost Lives," the theme of the drive. Typical results were a 37½ percent improvement in the quality index at Columbus, while the Louisville plant jumped one whole rating in the army's quality control classification.

By soliciting the cooperation of workers in a recruiting drive, the Buffalo plant helped ease the labor shortage. The drive featured war bonds as prizes for recruiting the most workers, while each recruiter was given a button indicating the relative number of employees recruited.

Family days, sponsored by the labor-management committees in the Buffalo, Columbus, and St. Louis plants, gave workers an opportunity to take their families through the plant and point out their vital roles in building combat planes. Right after family day, the Buffalo plant showed a 15 percent drop in absenteeism and a 25 percent gain in employment applications.

Throughout the campaign, the company coordinated all the available mediums to appeal to employees: posters, banners, booklets, contests, prizes, plant broadcasts, and articles in the plant newspaper. The psychological appeal to employees rested on patriotism, loyalty, pride, emotions, and self-welfare. Thus, by cooperating with the campaign, employees helped themselves and the war effort. Interest generated by the various drives sustained worker support throughout the first six months of the campaign, which is still being carried on by the company.

At the end of the first six-months period, Columbus awarded "100% Production Soldier" pins to 4600 workers, St. Louis gave out 4230 pins, while Louisville distributed 1250 pins. The awards were made at special dinners, with entertainment provided.

In a nut-shell, it turned out to be an interesting and enjoyable way to help win the war effort for thousands of the company's employees.

Wire Racks Cut Painting Time

Twenty tachometer-housing adapters are loaded onto a Ford-developed paint rack. A boss on the part fits into a receptacle welded to the cross-arm at each station, and a cup-like mask is dropped onto the piece to seal an opening. With individual masking and painting, the time per piece was 5 to 6 min. Now the entire batch of 20 is handled in less time than for single pieces

Fifteen to 20 small parts for the Pratt & Whitney engine are now spray-painted simultaneously at the Ford Aircraft Engine Plant in less time than formerly required for one piece. The saving is effected by use of multiple-station racks (incorporating integral masks) upon which an operator bench assembles the parts in a few moments. When the rack is transferred to a water-wash spray booth, the entire group of pieces on a rack can be coated with a few passes of the spray gun. After the parts are dry, they are stripped from the rack, which is then returned to the loading station.

A rocker arm cover box is positioned at each station of this rack by two pins entering bolt holes in the part and a plate mask that snaps into the rear. A cork is inserted in the larger drilled hole in the cover box

What Knurling Tool to Use On the Screw Machine

BY A. AINSWORTH, GENERAL FOREMAN, SCREW MACHINE DIVISION,
THE McKINNON INDUSTRIES, LTD.

Each of four types of knurling toolholders for Brown & Sharpe automatics presents a distinct advantage on certain classes of work. Here are suggestions as to best applications for each

KNURLING is one of the most interesting and versatile operations performed on a Brown & Sharpe automatic screw machine. A designer is seldom daunted by a knurling problem because of the many ingenious methods of application, and knurling tools along with thread-rolling and marking tools have become an everyday necessity in the screw machine industry.

So much progress has been made in the manufacture of standard knurling tools that it is now as uneconomical for the individual plant to make knurls for its own use as it would be to make standard twist drills or taps.

Four Methods of Application

In using knurls on Brown & Sharpe automatics there are four principal methods of application which require the following types of toolholders: (*a*) side knurl holder; (*b*) adjustable turret knurl holder; (*c*) top and bottom knurl holder for cross-slides, and (*d*) turret swing tool knurl holder.

Before taking up each of these types of knurling in order, there are several points in good knurl tool usage that should be emphasized. These include:

1. Feed a knurl into the work only a distance equal to the depth of tooth on the knurl. Extra feed results in loading of knurl, tearing of work and reduction of knurled diameter.

2. The coarser the pitch on the knurl tool, the greater the displacement of metal, resulting in larger knurled diameter on part. The reverse is also true.

3. In computing necessary rise on knurl cam, add 0.010 for approach, in addition to rise as required by pitch of knurl chosen.

4. A dwell of 0.01 cam space at the end of knurl cam will allow knurl to clean up and produce a much better looking knurled diameter.

5. Steady even knurl feed is necessary to keep the knurl in track. A hesitating or uneven rise on the cam will result in torn, poor knurling.

6. Blunt knurls of 90 deg. angle are superior on soft metals such as brass, while the more acute 70 deg. angle knurls are better for use on steel.

7. Good knurling cannot be obtained consistently when the diameter to be knurled is not constant.

8. Design the cam and adjust the set-up so that knurl does not jab into the work. Lack of care on these points results in unsatisfactory knurling and heavy wear on knurl and pins.

9. Double knurls, which cannot raise diameter as required, are caused by failure to feed knurl the required distance into the work.

The most common and easy to apply method of knurling is with the side knurl holder, which consists of a circular disk similar to a cross-slide circular tool. Mounted into the face of this holder is a single or double knurl rotating on ground steel pins. The use of this type equipment requires an open cross-slide circular toolpost.

This is the most simple method of knurling to set up and adjust and for which to design cams and on simple parts such as are shown in Fig. 1 and Fig. 2 there is no need for turret tools. When used with a turret support as in Fig. 3, wide knurling can be accommodated.

In using this type of holder it must be remembered that a great deal of side pressure results with resultant strain on the machine's spindle bearings. It is also advisable to use light feeds and provide for a dwell at the end of the cam rise.

Most Versatile Toolholder

By using larger holders, the width capacity of No. 00 and No. 0 Brown & Sharpe automatics may be equipped with the wider standard knurls designed for the No. 2 automatic.

This type of holder is probably the most adaptable and versatile of the group for with it can be produced straight, diamond or spiral knurled diameters with a pair of straight

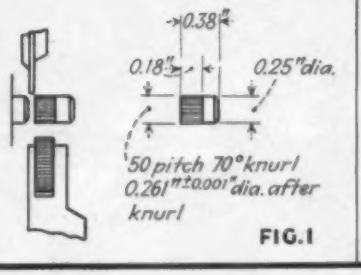


FIG. 1

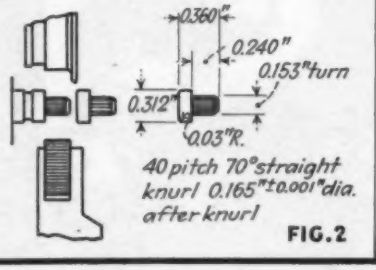


FIG. 2

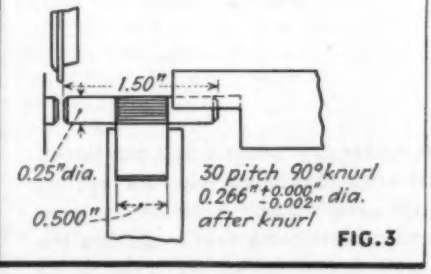
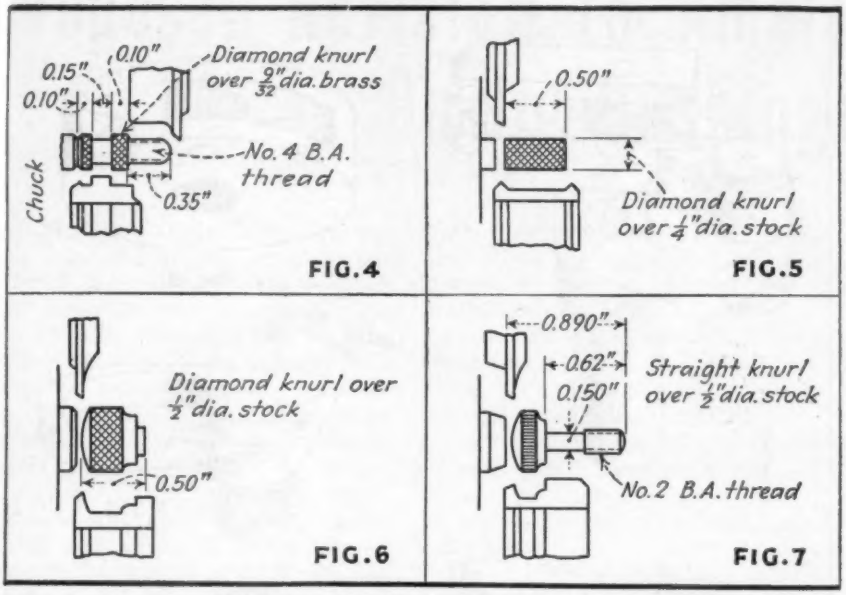


FIG. 3

Side knurl holders can best be applied to this type of knurling



This wide variety of knurls is handled with adjustable turret knurl holders

knurls. This variety is obtained by adjusting knurls in their blocks. By adjustment, this holder is capable of knurling within the complete range of the machine for both diameter and length of part. One important feature is that this type of holder can be fed successfully at a rate seven times greater than in cross-slide knurling.

In this method, side pressure is eliminated but it requires knurling both on and off the work. The off-feed, however, is double that of the on-feed. This requirement results in the cam lobe for turret knurling resembling closely a solid threading die lobe and is often confused for the latter.

There are several considerations which govern the choice of this method of knurling among which are these: It can be used when both cross-slide toolholders are required for other tools; cam design and set-up are rather simple; faster feeds and lower clearance requirements often lead to its choice over swing knurling; use of the turret knurl leaves the cross-slide to remove burr.

Three courses may be followed to remove the objectionable burr which results from turret knurling. In the first, after one part has been severed from the bar, (Fig. 4) the combination cut-off and form tool drops back to allow threading and knurling, then again approaches work to remove the burr. Again dropping away the cam allows the finished piece to be fed to length and the cut-off tool approaches to sever the part.

The second method is shown in Fig. 5. Here knurling is over stock diameter and requires no forming to size. The form tool is so designed as to either break corners or produce a chamfer, as required. Fig. 6 illustrates the third method. This can be applied where the length of part is not prohibitive. The part is knurled over its entire length. The form tool immediately follows the knurling operation and removes the knurl wherever it is not required.

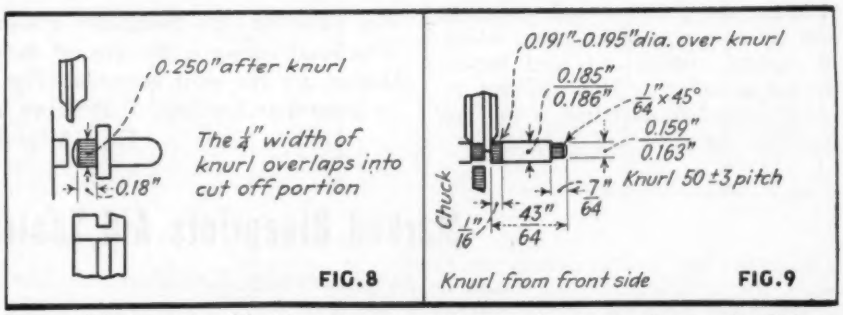
Fig. 7 shows another type of knurling which can be done well by the adjustable turret method. By forming or box tooling previous to the knurling operation much machine time is saved, as it is not necessary to knurl the entire length of the part. This principle may be applied when the diameter to be knurled is larger than any other diameter over which the knurl must pass to reach the starting point.

In principle, the use of top and bottom knurl holders for cross-slides is similar to the use of a side knurl holder. A hub is ground on the circular tool and the knurl holder is inserted over this tool and clamped into the cross-slide toolpost together with the circular tool. An adjusting screw permits the knurl to be set as required.

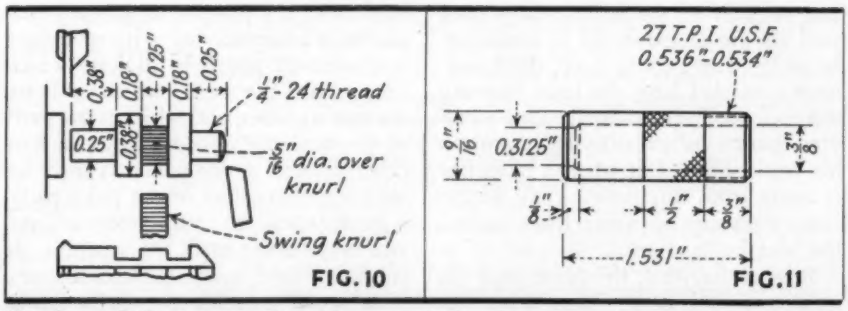
This method is applied when all turret positions are taken by other necessary tools or where no other turret tools would be required, providing the part can be top and bottom knurled. When used it results in a fairly simple set-up.

Disadvantages include the facts that it can be applied only when the required knurled width does not exceed that of standard knurls mounted in the holder (Fig. 8) and cannot be used where the required knurl is close to either form or cut-off tool.

In Fig. 9 it can be seen that a top knurl holder is used in conjunction with a combination cut-off and form tool and a side knurl holder. The part is fed to length into a combined stop and support. The combination cut-off and form tool, which contains top knurl, advances and knurls the large diameter. Passing over the top of bar, the knurl loses contact and the cut-off tool severs one piece and finish forms the next. Drop back on the cam allows this holder to clear the side knurl hold-



Top and bottom knurl holders for cross-slides are best suited to work of these types. They can be used when all turret positions are filled



Knurling of the type in Fig. 10 can only be done by using turret swing toolholders. They are also useful for the type of work shown in Fig. 11

er, advancing to knurl the small diameter. At the completion of this knurl, the cut-off tool again returns to remove the burr. Clearances for approach and drop away of knurls are slight for this job, but are quite workable.

Complicated Camming Required

This fourth method of applying a knurl requires somewhat complicated camming. In application, provision must be made for approach of the knurl before the cross-slide may feed the knurl into the work. Likewise, at completion of knurling extra clearances must be provided to assure the cross-slide clearing away before the swing knurl may be indexed out of position.

Figs. 10 and 11 illustrate two types of work that can be done more easily or only by the swing tool method. The knurl shown in Fig. 10 could be done only this way, while the operation in Fig. 11, if done by side knurling, would require the use of special width knurls. In turret swing knurling, on this particular job, a ¼ in. wide knurl is fed into the bar by cross-slide and then allowed to dwell while the turret advances the knurl along the bar to complete the required knurled width.

In using swing turret knurling a guide is required to replace the regular raising block on right-hand cutting jobs. When left-hand spindle direction is required, no block can be inserted under the front cross-slide if a cutting tool is to be applied in this position. In this event, a special guide is installed, by bolting, to the side of the toolholder.

There are practical and profitable uses for each type of knurling, which, if correctly chosen and used present distinct advantages. This, however, requires careful consideration of knurling needs before cams are designed.

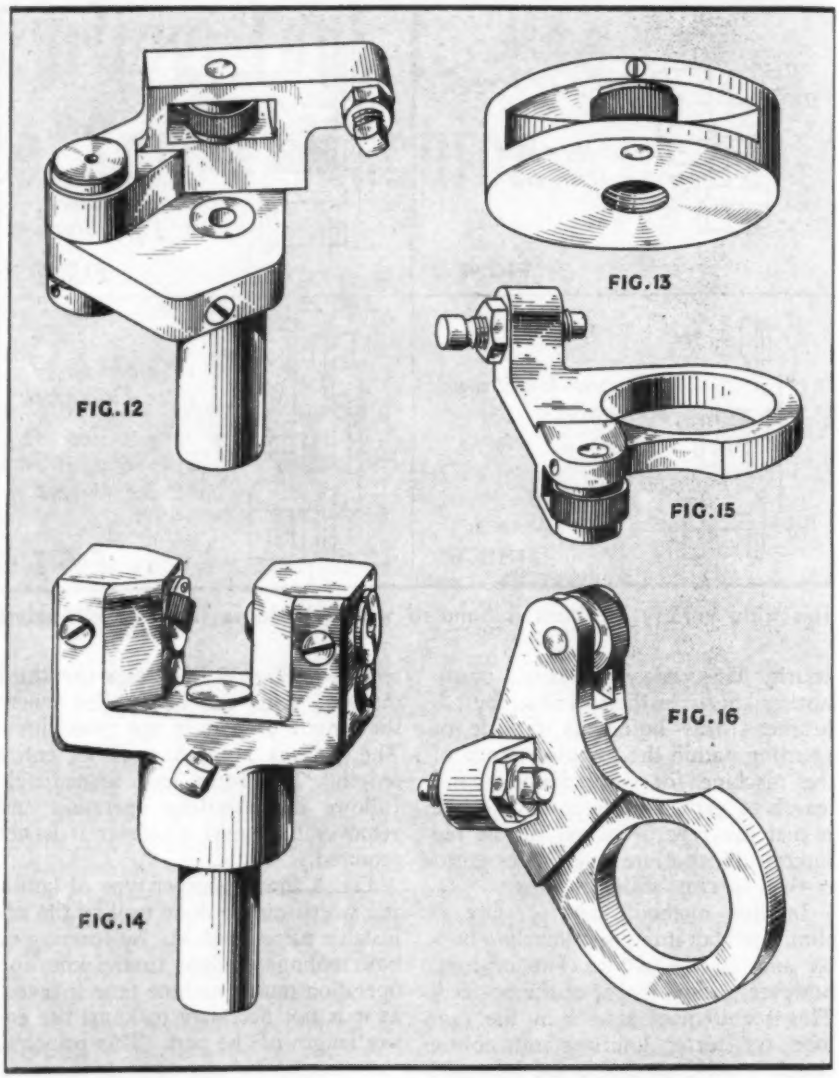


Fig. 12—This type toolholder is used for turret swing knurling. Fig. 13—The side knurl holder is the easiest to apply. Fig. 14—Adjustable turret knurl holders are the most versatile. Figs. 15 and 16—Two toolholders are used for cross-slide knurling. That shown in Fig. 15 is for top knurling and that in Fig. 16 for bottom knurling

Marked Blueprints Aid Toolroom

BY J. A. MACDONALD, CATERPILLAR TRACTOR CO.

IT IS COMMON PRACTICE for the tool designer to show on his assembly drawing an outline of the workpiece and outlines of the cutting tools used with the jig or fixture he is designing. In order that he can keep these outlines separated from the lines showing the tool itself, he normally uses a colored pencil when drawing them on his work sheet. But when a blueprint is made from this drawing, all of the lines show up as white lines against the blue background.

It often happens, therefore, that the toolroom will have difficulty in determining which lines of the assembly drawing show the outline of the jig or fixture they are to make, and which lines show the position of the workpiece or the cutting tools. We therefore make it a practice to go over each assembly blueprint for a jig or fixture with colored pencil to indicate which lines show the parts, which indicate the cutting tools, and which show parts of the machine, work-holding chuck or other device. A red pencil is used for marking the outline of the piece parts, a green pencil for cutting tool outlines, and a yellow pencil for machine or chuck outlines and machine clearances. This work is done by girls, junior draftsmen or apprentice draftsmen and, since they refer to the original drawing, it does not take long to learn how.

Not only have we eliminated many of the difficulties and misunderstandings ordinarily experienced between the tool designer and the toolroom with differentiating between outlines on an assembly drawing, but we have found that such marked blueprints are of considerable help to the set-up men in the production department. Their time is saved, we are sure that the proper cutting tools are selected, and frequently we eliminate the need for sending a tool designer to the toolroom or the production floor to help "read" or interpret a tool assembly blueprint.

Proposed Revision to American Standard On Jig Bushings

IT IS NOW TWO YEARS since the American standard for jig bushings was adopted and made available to industry. This standard is widely used and has obvious advantages. It specifies outside diameters of jig bushings for a range of hole sizes which simplifies jig design. In addition it gives tolerances for the maximum and minimum values of bushing holes.

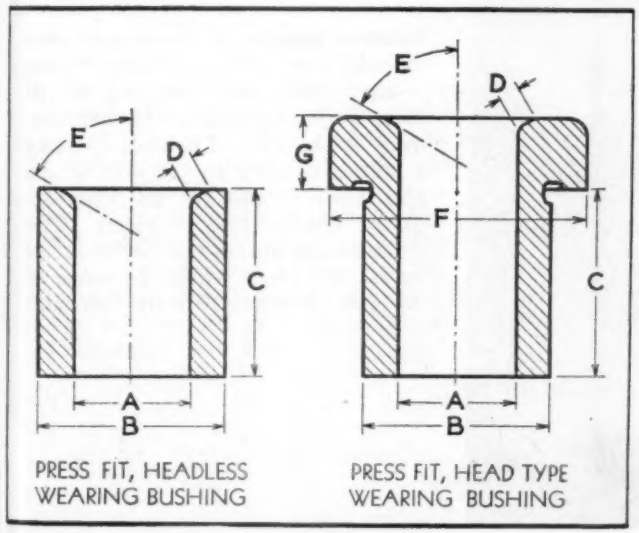
However, a few users of the standard have experienced difficulties in the use of these bushings, particularly on the smaller sizes of press fit wearing bushings. Table I showing this standard is reproduced here. Certain plants have found the range of sizes to be inadequate where a multiplicity of small holes must be drilled.

Some of the bushings have been found to close in when pressed into the jig plate, indicating that the bushing wall is too thin, or that the press fit is too tight. Perhaps a greater clearance should be allowed between the outside diameter of the drill and the inside diameter of the bushing in this range.

The subject is particularly timely now since the revision of this standard has been undertaken by Sectional Committee B-5, of which the American Society of Mechanical Engineers is the administrative sponsor, under the procedure of the American Standards Association. This committee is particularly anxious to receive suggestions as to improvements that might be made in A.S.A. jig bushing design and would welcome suggestions and comments from users. Please address comments to W. C. Mueller, chairman, American Society of Mechanical Engineers, 29 West 39 Street, New York 18, N. Y., or to this publication.

Table 1 Press Fit Wearing Bushings—Headless and Head Types

Range of Hole Size[1,2] A		Body Diameter B					Body Length[4] C			Width of Chamfer[5] D	Head Diameter[6] F	Head Height G
		Unfinished[3]			Finished							
From	Up to and Including	Nominal	Max	Min	Max	Min	Short	Medium	Long		Max	Max
0.0156	0.0625	5/32	0.166	0.161	0.1578	0.1575	5/16	.....	1/2	1/32	1/4	3/32
0.0630	0.0995	13/64	0.213	0.208	0.2046	0.2043	5/16	.....	1/2	1/32	5/16	3/32
0.1024	0.1378	1/4	0.260	0.255	0.2516	0.2513	5/16	.....	1/2	1/32	3/8	3/32
0.1406	0.1875	5/16	0.327	0.322	0.3141	0.3138	5/16	1/2	3/4	1/32	7/16	1/8
0.1910	0.2500	13/32	0.421	0.416	0.4078	0.4075	5/16	1/2	3/4	1/16	17/32	5/32
0.2520	0.3125	1/2	0.520	0.515	0.5017	0.5014	5/16	1/2	3/4	5/64	5/8	7/32
0.3160	0.4219	5/8	0.645	0.640	0.6267	0.6264	1/2	3/4	1	3/32	13/16	7/32
0.4375	0.5000	3/4	0.770	0.765	0.7518	0.7515	1/2	3/4	1	7/64	15/16	7/32
0.5156	0.6250	7/8	0.895	0.890	0.8768	0.8765	3/4	1	1 3/8	7/64	1 1/8	1/4
0.6406	0.7500	1	1.020	1.015	1.0018	1.0015	3/4	1	1 3/8	7/64	1 1/4	5/16
0.7656	1.0000	1 3/8	1.395	1.390	1.3772	1.3768	3/4	1	1 3/8	9/64	1 5/8	3/8
1.0156	1.3750	1 3/4	1.770	1.765	1 7523	1.7519	1	1 3/8	1 3/4	9/64	2	3/8
1.3906	1.7500	2 1/4	2.270	2.265	2.2525	2.2521	1	1 3/8	1 3/4	7/32	2 1/2	3/8



All dimensions given in inches.

Tolerance on fraction dimensions where not otherwise specified shall be ±0.010 inch.

[1] Hole sizes are in accordance with the American Standard for Twist Drill Sizes (ASA B5.12–1940).

[2] The maximum and minimum values of the hole size, A, shall be as follows:

Nominal Size of Hole	Maximum	Minimum
Above 0.0000 to ¼ in. incl.	Nominal +0.0004 in.	Nominal +0.0001 in.
Above ¼ to ¾ in. incl.	Nominal +0.0005 in.	Nominal +0.0001 in.
Above ¾ to 1½ in. incl.	Nominal +0.0006 in.	Nominal +0.0002 in.
Above 1½	Nominal +0.0007 in.	Nominal +0.0003 in.

[3] The body diameter, B, for unfinished bushings is larger than the nominal diameter in order to provide grinding stock for fitting to jig plate holes. The grinding allowance is
0.005 to 0.010 in. for sizes 5/32, 13/64, and ¼ in.,
0.010 to 0.015 in. for sizes 5/16 and 13/32 in., and
0.015 to 0.020 in. for sizes ¼ in. and up.

[4] The length, C, is the overall length for the headless type and the length underhead for the head type.

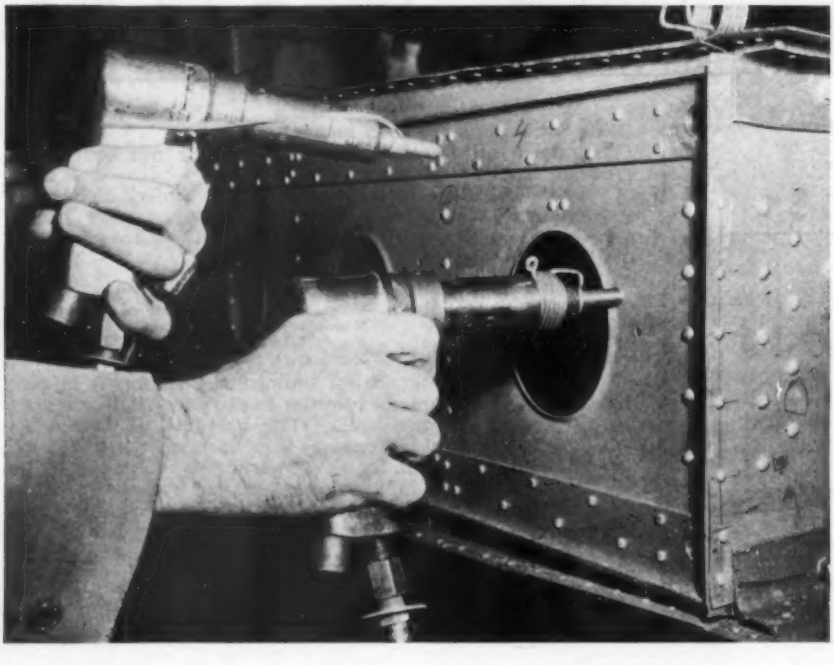
[5] The angle of chamfer, E, shall be 59 deg ± 1 deg and a slight radius shall be provided at the intersection of this chamfer with the hole, A.

[6] The head design shall be in accordance with the manufacturer's practice.

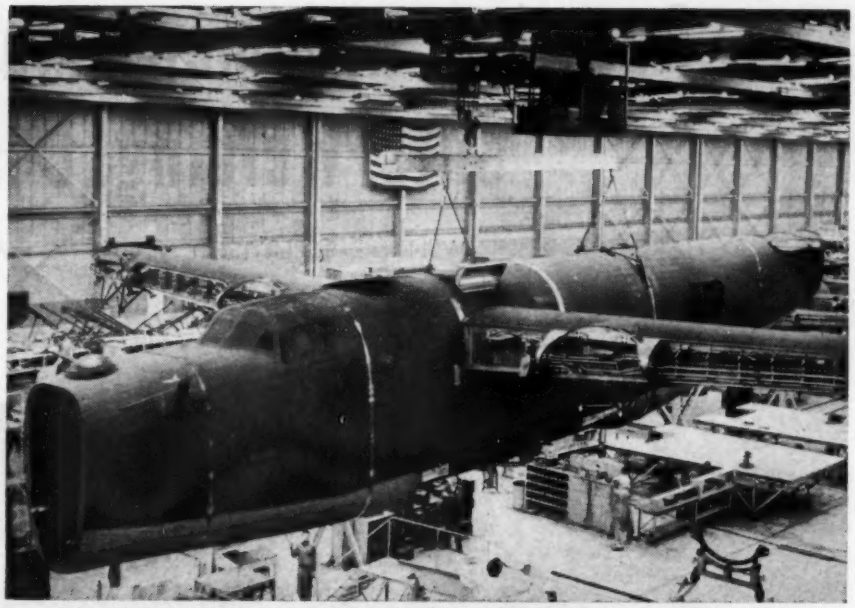
SHOP SHOTS

FROM AIRCRAFT PLANTS

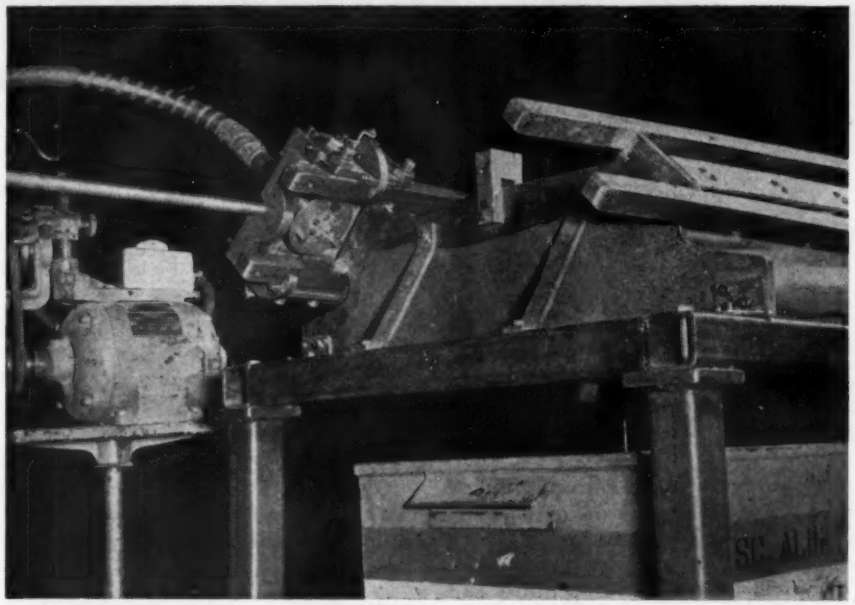
This cart is not designed for afternoon tea but as a portable gage room for checking measuring instruments on the job. It tests micrometers from one to ten inches, snap gages, plug and ring gages, dial bore gages and other inspection equipment used at the machine through the use of precision masters. Result: gages are checked daily without interrupting their use, work spoilage is prevented and man-hours are saved. Hamilton Standard Propeller.



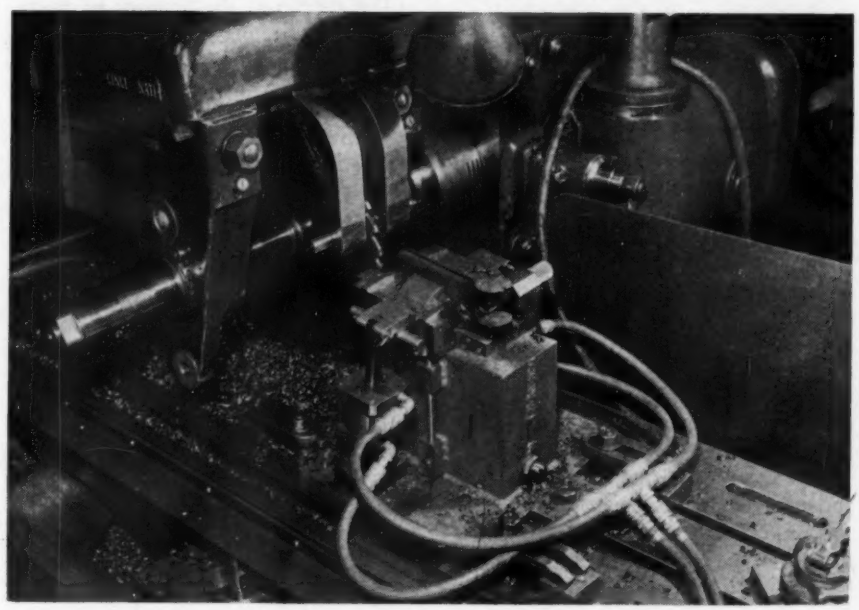
Rubber bands are frequently used to hold rivet sets in pneumatic guns to keep them from vibrating out of place during operation. An improvement on this method is made by using a spring attached to the end of the gun which retains the set more securely, thus adding to safety. The spring action makes the device useful on any size of set within the range of the gun. Douglas Aircraft Company.



Partially completed Liberator bombers and Liberator Express Transports are lifted from mating jigs at a Fort Worth plant by this specially constructed load bar. The device speeds placement of the ships on the assembly line and eliminates the use of two monorail cabs and one bridge. Separate shackles allow for the difference in centers of gravity between Liberator bombers and Express Transports. The normal loading hooks are used but the bar is offset in order to compensate for the absence of the plane's engines. The bar is counterweighted to hang horizontally when not in use. Consolidated-Vultee Aircraft Corporation.



A milling device now machines an angular surface on the air scoop of the Mitchell (B-25) bomber in ten minutes; formerly an hour and forty-five minutes was required. The arrangement consists of a holding fixture (on the table) into which the part to be machined is placed. This fixture has guides for the cutter head which is moved along them by means of a crank and leadscrew. The three-toothed cutter is driven by a 1/3-hp. electric motor through a flexible shaft. A corresponding surface on the opposite side is milled in the same setup. North American Aviation.



Only ten seconds are needed to load a wing fitting in this pneumatic fixture instead of the four minutes required when the part was clamped by screws. The first half of the stroke centers the part, the second half clamps it. A cylinder on each side delivers 500 lb. pressure to the piston rod (with 90-lb. line pressure) which is further increased by leverage. The operation is milling a 0.340 slot 2½ in. deep in an SAE 4140 steel forging. The 16½-in. diameter cutter has 36 Kennametal teeth with a 5-deg. negative staggered helix and a neutral rake. This tooling eliminated two operations, reduced slotting time from 75 to 2 minutes. Vega Aircraft Corporation.

Rotating Weldment Manipulator Cuts Welding Costs

BY HAROLD E. BAILIE, WELDING SUPERVISOR, NORDBERG MANUFACTURING COMPANY

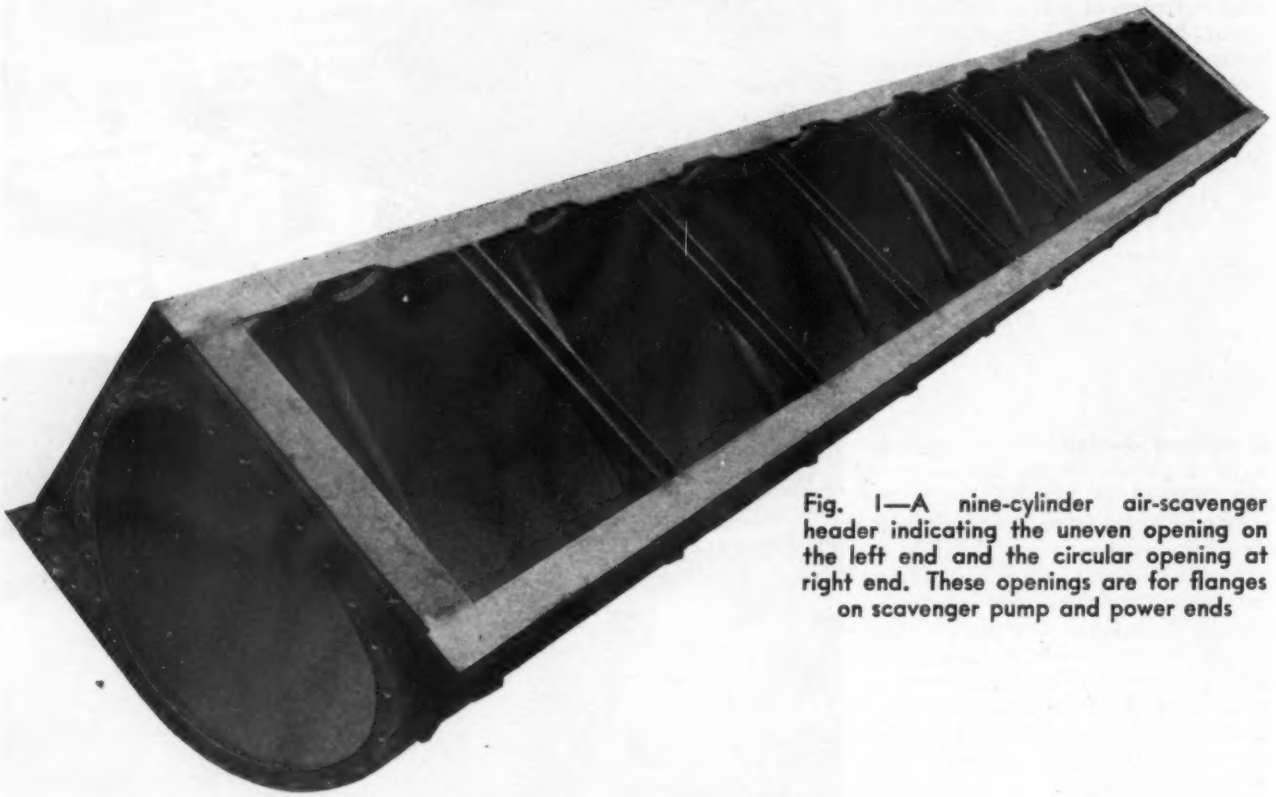


Fig. 1—A nine-cylinder air-scavenger header indicating the uneven opening on the left end and the circular opening at right end. These openings are for flanges on scavenger pump and power ends

An easy-to-make manipulator cuts scavenger header welding costs in two by saving time and labor. The manipulator could be adapted to other odd-shaped weldments usually requiring much time, and labor-wasting positioning during the welding

A 48 PERCENT SAVING in the welding cost of air-scavenger headers was achieved by the Nordberg Manufacturing Company by making an arc-welded manipulator for the nominal cost of $107.18. Moreover, the saving in the first two weldments made with the manipulator more than absorbed this outlay.

Development of the manipulator began when the company was called upon to fabricate 4050-lb. to 5750-lb. for 2500-hp. to 3500-hp. stationary and machine diesel engines. These units were six- and nine-cylinder types ranging from 18½ ft. to 27 ft. in length (see Fig. 1).

The nature of the sections of these headers did not make them suitable for a tilting type manipulator, even though the welding sequence planned necessitated turning the weldment 72 times to keep the unit straight and within the ¼ in. allowed for machining certain surfaces extending the full length. But since the work was to be done in a shop area serviced by a 10-ton hand-operated crane with one hook, the crane was adapted to shifting the weldment load by using a long piece of 2½ in. rope with S hooks at each end to grip the load (see Fig. 2).

In this manner, the load could be canted and blocked, the hooks repositioned, and the load toppled to the next face. But it necessitated making four individual lifts when the load had to be turned 180 deg. Moreover, each turn required an average of 20 min., during which the welder waited and the crane man and hitcher made the move. Seventy-two lifts taking 20 min. each meant 24 hours added to the 26 hours actual welding time for each header.

Old Method Hazardous

Aside from the large waste of time in positioning the weldment, this method constituted a damage hazard to the table on which the header was set up for welding, and also a safety hazard to the workmen because the rope span limited close control of the unit while being turned. Besides, this prevented the setting up of another weldment on the table while one was being welded.

To overcome these difficulties, it was decided that if the weldment could be attached to fixtures, the entire unit might be placed on a set of rollers and rotated by a separate drive without having to use the crane. A slight re-

This article is based on a study submitted to the James F. Lincoln Arc Welding Foundation in its $200,000 Award Program.

arrangement of the joints of the set-up made the rotation of the weldment feasible. A Cullen-Friestedt 2500-lb. welding positioner with hand-operated tilt placed at 90 deg. was used to rotate the work, thus necessitating the making of two manipulator fixtures to hold the work between them and three sets of dead rollers on which they could ride as the work turned.

The six rollers were made by rolling pieces of ½ in. plate (6 in. wide) into small hoops of 12 in. outside diameter and welding the seam. Then 12 pieces of ½ in. plate were torch-cut into disks, 11 in. in diameter with a 2-in. hole in the center. After proper beveling for welding, the disks were welded into the ends of the rolled pieces, forming hollow rollers. Through the 2-in. hole in each roller, a 2-in. cold-rolled shaft 12 in. long was inserted and welded, forming a fixed shaft extending 3 in. on each side of the roller.

A round cast iron bar was used to make twelve cast iron bearings (two for each roller) to fit the roller shafts and slip into the notches in the roller boxes. Fig. 3 indicates a cross-section of one of these bearings, with its ½ in. circular groove for the notches, and its 2 in. inside diameter to slip over the shaft.

Making Roller Boxes

The boxes to hold the rollers were constructed of ½ in. plate, 9 in. wide, 38 in. long and 12 in. high. To accept the rollers and their bearings, the upper sides of the boxes were notched with 2½ in. diameter circular notches on 4 in. centers. The radius point for the notches was located ¼ in. below the top of the box to prevent the bearings from riding out of the notches while work was being turned on the rollers. Seven notches allow for adaptability for other diameters and other work than the header job alone (see Fig. 4).

To construct the circular manipulating fixtures to ride on the rollers, two ¾×6 in. bars were rolled to 60 in. inside diameter and seam welded, forming two hoops. Then four segments of salvage plate were torch-cut into circular bands with a 60 in. outside diameter and a 54 in. inside diameter and welded to the inner surface of the hoops about ½ in. off from the center, two to each hoop, forming a slightly lopsided rolled T-bar. Then six spokes were made from 2½ in. standard pipe for each wheel, connecting the outer wheel to a circular piece of torch-cut 1 in. plate, 40 in. in diameter. The spokes are set at an angle, forming a dish-shaped wheel with its center free of the outer rim of the wheel so that work larger than the

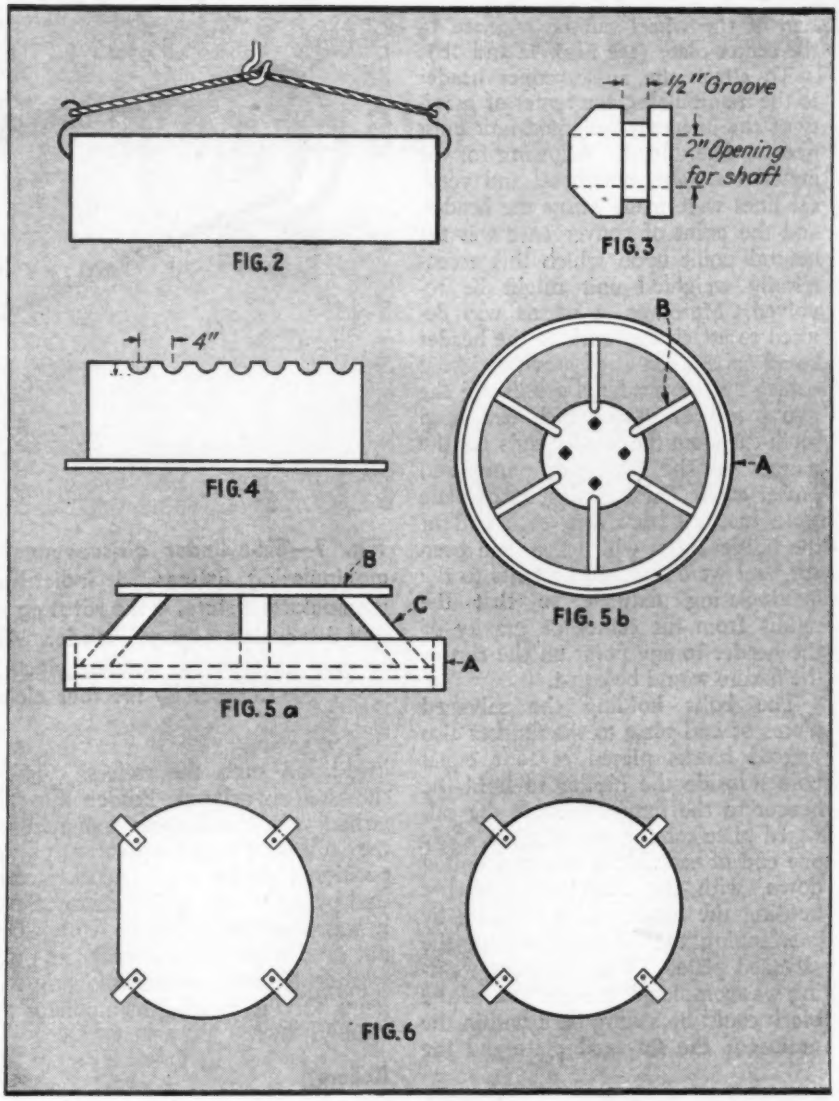


Fig. 2—The original way the weldment load was shifted was by use of a rope 2½ in. in diameter with S hooks at each end to grip the load. This was necessary because this area of the shop was serviced with a 10-ton hand-operated crane with one hook. Fig. 3—Cross-section of one of the twelve cast iron bearings, indicating the ½-in. circular groove enabling the bearings to fit into the notches of the roller boxes. The 2-in. horizontal opening enables it to slip over the shaft. Fig. 4—Side view of the roller box with seven circular notches 1½-in. deep and 2½ in. in diameter, cut on 4-in. centers. The radius point for the notches was ¼-in. below the top of the box to prevent the bearings from riding out of the notches. Figs. 5a and 5b—Side elevation and front-view of the circular manipulator fixture. Fig. 5a—A indicates outer edge which rides on the rollers; made by welding together pieces of salvaged plate. The wheel spokes, B, were made from 2½-in. standard pipe, while C, the circular piece of torch-cut 1-in. plate, becomes the work holder since this is where the air-scavenger header is attached to the manipulator fixture. Fig. 6—These are the two pieces of plate usually discarded after being torch-cut from the ends of the headers. To permit the attachment of the manipulator to the work without damaging it, these scrap pieces are inserted into the openings from which they were cut and four bolts attached to pierced blocks close to the outer edges of the plates. Only attached by single bolts, these blocks can hold the work securely when in place by overlapping the inside of the header. They can be easily pushed aside and removed from the completed header when the work is finished, and later detached from the manipulator fixtures, while a new header is being rigged

size of the wheel can be attached to the center plate (see Figs. 5a and 5b).

To attach the air-scavenger header to the manipulator, the center of gravity of the unevenly weighted unit must first be determined. Allowing for the material weight, horizontal and vertical lines were made across the header, and the point of convergence was the neutral point upon which this eccentrically weighted unit might be revolved. Moreover, a means was devised to attach the work to the header based on this center of gravity without damaging the header, by utilizing the two pieces of plate which had been torch-cut from the header ends for the flanges on the scavenger pump and power ends. These two pieces of plate were inserted back into each end of the header from which they had been cut, and were fastened by bolts to the manipulating fixtures, so that the radius from the center of gravity of the header to any point on the rim of the fixture would be equal.

The bolts holding the salvaged pieces of end plate to the fixtures also pierced blocks placed at four equal points inside the header to hold the header to the fixture without the salvaged plate coming out of place. Only one end of each block was thus bolted down, with the other end free but holding the header to the fixture by overlapping the circumference of the salvaged plate. Thus, when the welding was completed, the free end of the block could be swung back within the radius of the salvaged plate and the

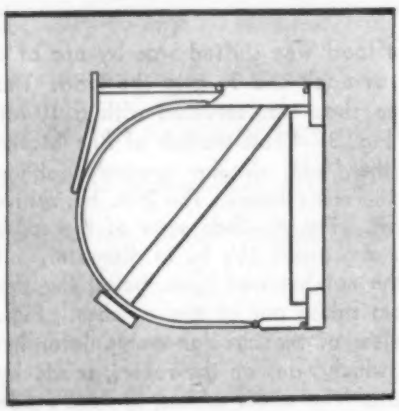


Fig. 8—Cross-section of the header indicating the points to be welded

header removed, leaving the salvaged plate still bolted to the manipulator fixtures. The waste plate could then be unbolted and discarded, while a new header was being rigged. See Fig. 6 for salvaged plates with four blocks in over-lapping position.

In this manner, the unit is attached to the manipulating fixtures before being lifted onto the rollers. Fig. 7 shows a six-cylinder header thus attached with the fixtures mounted on the rollers. The table rotation of the positioner shown was 1 r.p.m. motorized by a constant speed motor. Since it was available for other work when not needed on this assembly, its price was not included in the following cost items for the rotating manipulator assembly:

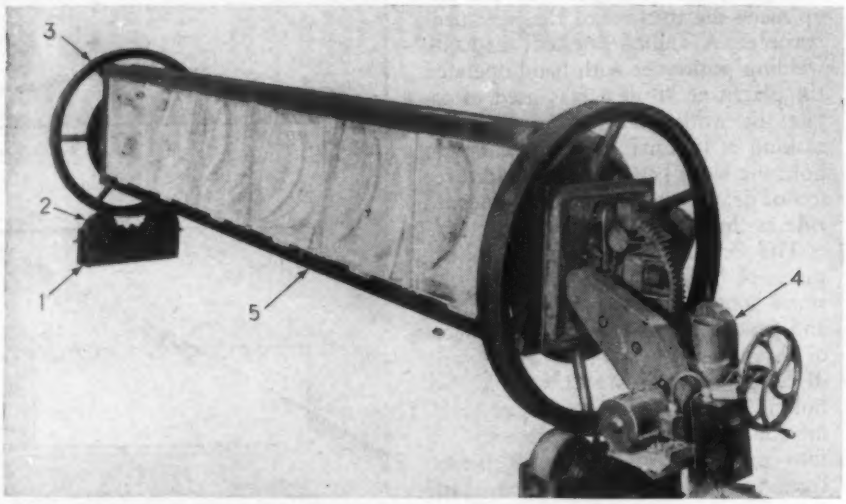


Fig. 7—Six-cylinder air-scavenger header head in place between two manipulating fixtures. 1 indicates the roller block, 2 the roller, 3 the manipulator fixture, 4 the rotating unit attached to one of the manipulators, and 5 the air-scavenger header. At the left end of the air-scavenger header may be seen the circular piece of scrap plate held to the inside of the header by the four blocks attached only to the plate

Rollers

Torch-cutting	$ 2.50
Welding	8.00
Materials	38.19
Total	$48.69

Manipulator Fixtures

Torch-cutting	$ 4.25
Welding	16.50
Materials	37.74
Total	$58.49
Grand Total for Rollers and Manipulators	$107.18

The saving remains the same where headers of greater weight and length are welded, since the number of turns would be the same. But longer headers require the third set of rollers and a support ring in the center of the weldment. Set-up in Fig. 7 requires only two sets of rollers.

Welding of the scavenger header weldment consisted of 427 lin. ft. of 3/16 in. bead laid in both fillets and multiple bead seams. Fig. 8 shows a cross-section of the header with the major portion of the welding involved. After welding, two holes per cylinder 8⅛ in. diameter are torch-cut in the top plate.

To promote the best typical fillet weld or multiple bead seam weld, the work should be placed so that the legs of the fillet weld are of equal length and the bead of the seam weld is of equal height on each wall of the seam. Work placed at a 45 deg. angle permits the best and easiest fillet weld, while work placed on a horizontal plane assumes the most desirable position for a seam weld.

Welding time for the header in the manipulator was 26 hours, a saving of 24 hours per header. The hourly saving of the three men involved was $2.67, or a total of $64.08 per header. Welding 52 headers a year would yield a $3332.16 saving. Nordberg's average saving on manipulator-held weldments is 50 percent.

Experienced People Should Order Repair Parts

DURING the throes of expansion, the authority to purchase repair parts for equipment was often vested in the hands of people having no knowledge of probable service life. In one case, an infrequently used size of V-belt was ordered by 100-lots. A Canadian plant has solved this problem by requiring that all requisitions of this nature must be reviewed by the maintenance department before the purchasing department (mostly women) can act in the matter.

Brushing Wheels Solve Many Metal-Finishing Problems

BY R. O. PETERSON, MANAGER OF TECHNICAL DEPARTMENT
THE OSBORN MANUFACTURING COMPANY

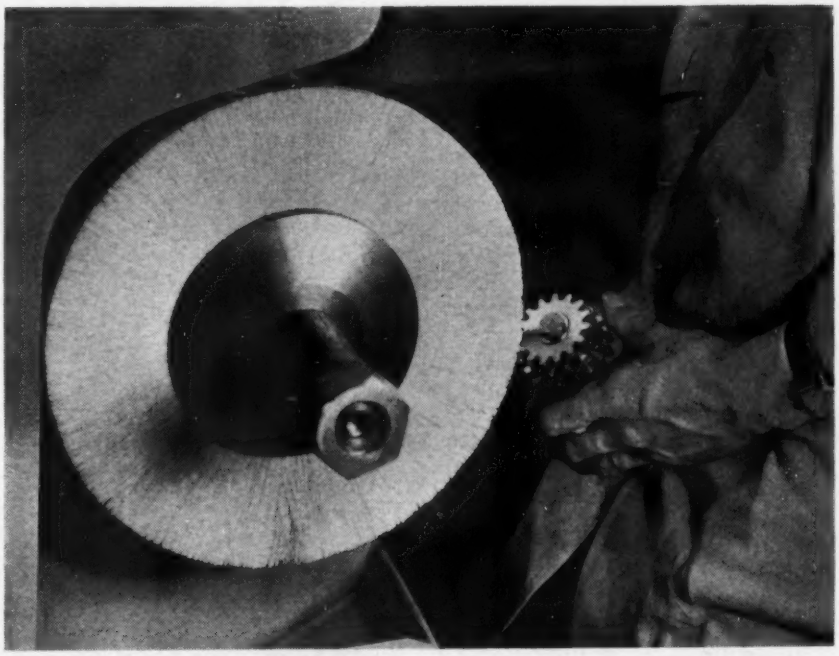
THOUGH brushing wheels have been used in industry for years, their widespread application as tools for metal-working purposes has come about chiefly since Pearl Harbor. To relieve production bottlenecks, especially in the manufacture of precision parts, many new applications and brush constructions have been worked out. So today it is not uncommon to find a metal-working plant using brushing wheels for 100 or more finishing operations.

Each application, whether it be removal of burrs, sharp corners, tool marks or scratches, or the improvement of surface finish and detection of cracks, must be engineered. There are no specific rules that can be set up to cover the many variables surrounding the use of brushing wheels as production tools. Each job has its own characteristics, and each must be studied by someone familiar with brushing wheel technique, construction of wheels, and effects of brushing speed, wheel size and manner of presenting the work to the wheel, which may be used with or without abrasive.

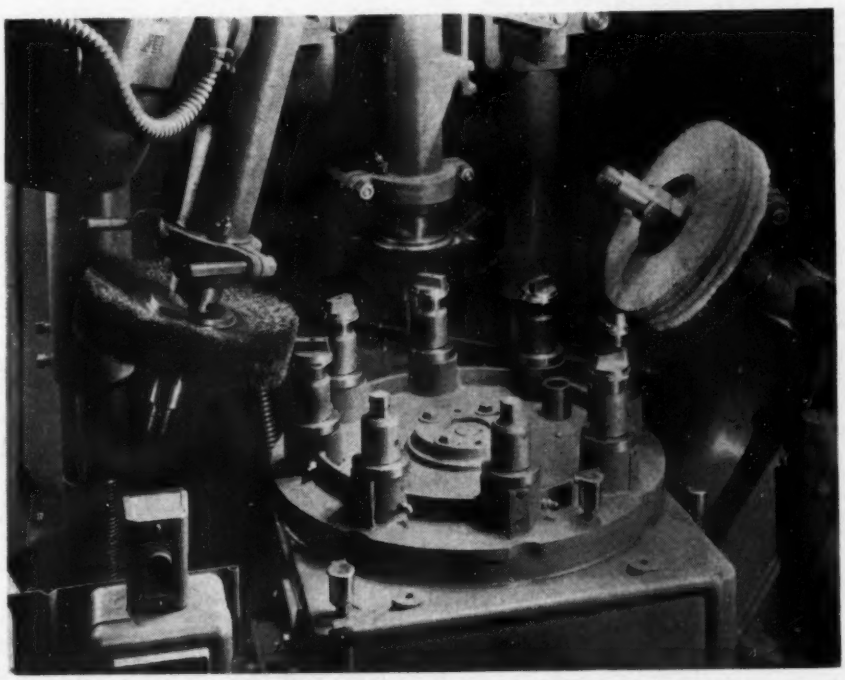
Selection of a brushing wheel for a given application is done best after compiling information along the following lines:

1. What is to be accomplished?
   - *(a)* Clean or remove—what material?
   - *(b)* Roughen or smooth—what kind of surface?
   - *(c)* Finish or polish—to what degree?
   - *(d)* Round corners or blend surfaces—how much?
2. What kind of equipment is available?
   - *(a)* Brushing lathe—what horsepower and speed?
   - *(b)* Automatic brushing machine—what type?
   - *(c)* Portable or flexible-shaft equipment?
3. What are the properties of the material involved, especially hardness?
4. At what rate and under what conditions must the work be done?

Answers to these basic questions will usually furnish the facts necessary



Fibers from a Mexican cactus, known as tampico, form the brushing portion of the wheel used to clean and deburr the teeth of a precision aircraft gear



Two wire brushes of different specifications and a tampico wheel are mounted on an automatic polishing machine to finish a high-production metal part

to determine brush type and material and the brushing technique required.

Brushing wheels can be made to produce a wide variety of finishes, depending on wheel material and how the wheel is applied. Coarse-wire wheels serve to rough-off burrs, scale, rust, welding scale and welding flux. Fine-wire wheels, with or without abrasive, are employed for removing small burrs, rounding corners slightly and producing finishes in proportion to the wire gage and abrasive grain size.

For rough, heavy cleaning, coarse-wire brushes of cup or radical construction are employed with electric or air tools operated at optimum rate to obtain quick results and long brush life. If the job is one of removing surface imperfections with minimum change in contour, consideration must be given to the flexibility of the brush fill, which may be wire, fiber, cord, nylon, hair, or certain combinations of these. It is also well to remember that harshness of the brush face increases as the trim, or effective, length of the brush material is decreased. Thus to penetrate crevices or recesses it is necessary to employ a large-diameter brush operated preferably at low speed.

Excessive application pressure shortens the life of the brush by causing excessive flexing of the brush material. Correct usage calls for touching the work to the brush as lightly as will give the desired results.

If the metal is too hard to be cut effectively with wire brushing wheels, abrasive compound is applied directly to the wire, fiber, or cord section. In selecting an abrasive compound, variations in grain and suspending medium must be considered. Some compounds are glue bound, others grease bound. Conditions of the application may require use of aluminum oxide, iron oxide, emery, or other abrasive, in paste or stick form, as a liquid or even dry.

Besides removing blemishes, brushing wheels can be employed to detect cracks or flaws by changing the surface appearance of castings, forgings, or machined parts. Slight defects hidden by tool marks will be revealed, and if there are none the durability of the article is increased by removing stress concentration points. There is also a brushing technique that removes fragmented metal which may hide a fracture or create the appearance of one.

Size, shape and peculiarities of the work may require that a fixture be devised for holding the part at the most efficient brushing relationship. Each case is a special study.

Some examples of engineered brushing applications for metal-working applications are as follows:

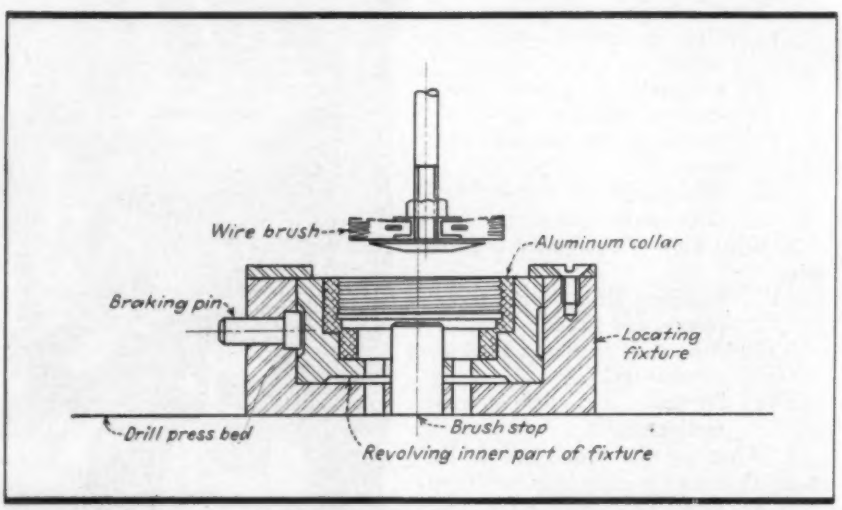
The 1/32-in. oil hole in the ball end of engine pushrods is counterbored 1/8 in. in diameter, and a sharp corner or burr must be removed. Non-uniform results were obtained by laborious hand rubbing with emery cloth. This bottleneck in engine production was overcome by applying a 10-in. cord wheel. The pushrod is held in a fixture so that the end can rotate while in contact with the brush, which operates at 2,400 r.p.m. Five parts are brushed per minute to a surface finish of four micro-inches, and any remaining unevenness consists of smooth undulations.

In flaring airplane tubing, small scratches and other imperfections often cause cracks to start when the ends of the tube are flared. Power-driven brushes have overcome this difficulty.

For a threaded brass shaft 1/2 in. in diameter by 2 1/2 in. long, the surfaces are blended and smoothed with a 12 in. tampico brushing wheel operated at 3,000 r.p.m. and an abrasive. The part is held in a fixture so that brush action causes the piece to rotate.

Brushes serve to strip insulation from wire of all sizes. In the case of a fine instrument wire, a hard, tough covering is removed without injuring the metal by inserting wire ends between two cylindrical brushes mounted on parallel shafts running at 3,450 r.p.m. The brushes, 2 in. long by 1 1/2 in. in diameter, contain fine steel wire so closely packed that approximately 250,000 cutting points are distributed over their surfaces.

With a piloted end-brushing tool, zinc chromate is removed from the metal adjacent to rivet or bolt holes in plane parts, so that a perfect metal-to-metal bond is secured. Perfect bonding avoids impairment of radio reception by discharges of static electricity from one part to another

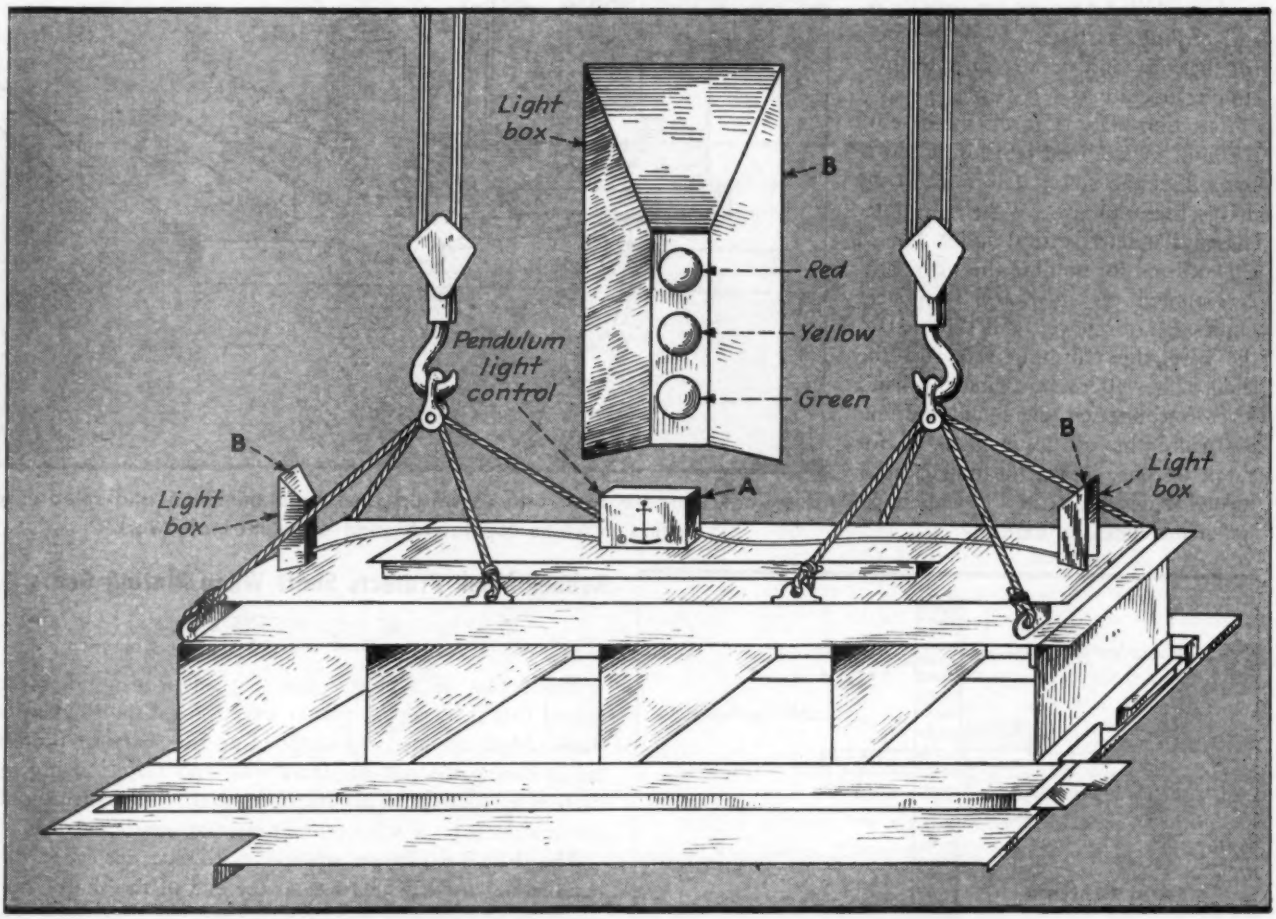


Silver plating is removed from the internal thread of an aluminum collar by mounting the piece in a revolvable fixture and brushing with a steel-section brush held in the drilling machine spindle

Practical Ideas

FROM PRACTICAL MEN

★ **War-Winning Suggestions appearing on these pages were selected from those recognized as meritorious by the Board of Individual Awards, War Production Drive. They are freely offered to industry as an aid to war production** ★



Red, yellow and green lights controlled by a pendulum are used to show crane operators when lifts are not level

Electric Light Signals Keep Heavy Crane Loads Level

BY LUCIEN H. ROSS
Marinship Corporation

When a heavy load lifted by two cranes is not level, added strain is placed on the crane holding the low side of the load, thus creating a safety hazard. Because there is no means of determining the levelness of the load, except by the eye of the person signaling the crane operators, and he on occasion is out of view of one operator, I devised the automatic load leveling device which can be seen by both crane operators.

It consists of box *A* containing a storage battery and equipped with a pendulum fitted with carbon brushes that contact a brass segment. An 80 ft. cable is connected to either side of box *A*. These extend to two posts *B* placed at the far ends of the load. The posts have three lights—a green one at the bottom, a yellow one at the center and a red one at the top.

If either of the cranes lifts the load out of level, the pendulum, which normally retains both yellow lights lit, will move into one of the contacts that light a green light on one post and the red light on the other post. The latter indicates that the load is low, while the green light shows that it is high. The crane operators immediately manipulate the load until the yellow lights are on, indicating that the load is level. The posts are equipped with shadow boxes so that the lights can be seen easily in daylight. *War Winning Suggestion recognized as meritorious by the Board for Individual Awards, War Production Drive.*

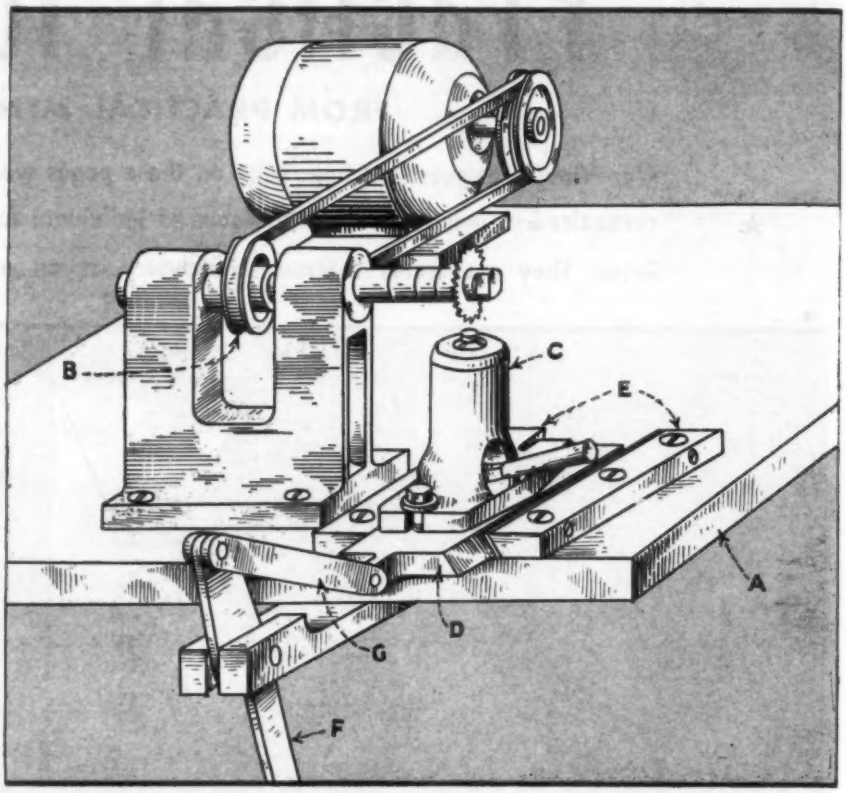
PRACTICAL IDEAS

Improvised Set-Up For Light Milling

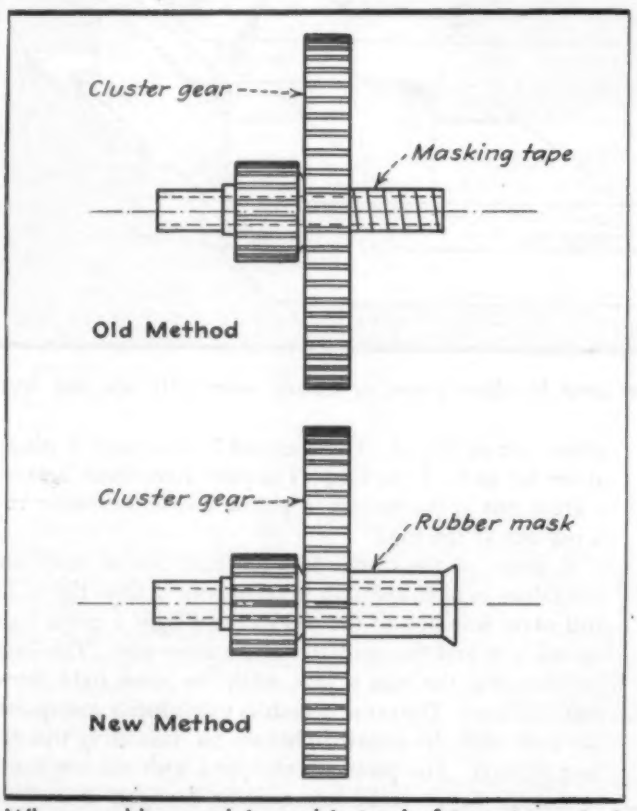
BY B. L. PETERS

An improvised single-purpose milling set-up that can be used for performing light hand milling operations is shown in the drawing. Because it is of single-purpose construction, set-up time is reduced to a minimum, relatively unskilled workers can operate it, and milling machines can be released for heavier and more intricate machining operations.

Cast iron plate *A* forms the base of the unit. A modified polishing head *B* is used as the cutter drive. A motor drives the arbor by a V-belt. A purchased standard vertical index fixture *C* is utilized for holding the work, and is mounted on slide *D*. Two steel guides *E* are screwed and doweled to the base, thus forming ways for the slide. The latter is actuated by hand lever *F*, connected to the slide by link *G*. Since this set-up is intended for single-purpose work, the only adjustment for depth of cut is by shimming under the indexing fixture.



This single-purpose tool reduces set-up time to a minimum and releases a milling machine for heavier and more intricate work



When a rubber mask is used instead of tape to protect this cluster-gear shaft during copper plating, production time is reduced about 83 percent

Rubber Mask Protects Shaft When Plating Gears

BY PHILLIP CHESTER
Foote Brothers Gear and Machine Corporation

Production of a cluster gear for an ordnance item required that it be copper plated, except for a short extension shaft. Masking tape was wrapped on the shaft for protecting it during the plating operations, and for removing the flash after plating. This method required 1½ man-hours per release for six releases, or nine man-hours per day.

The shaft is no longer wrapped with tape; instead, a rubber mask is used, which fits on the end of the shaft. As a result, the six releases require only three man-hours per day. *War Winning Suggestion recognized as meritorious by the Board for Individual Awards, War Production Drive.*

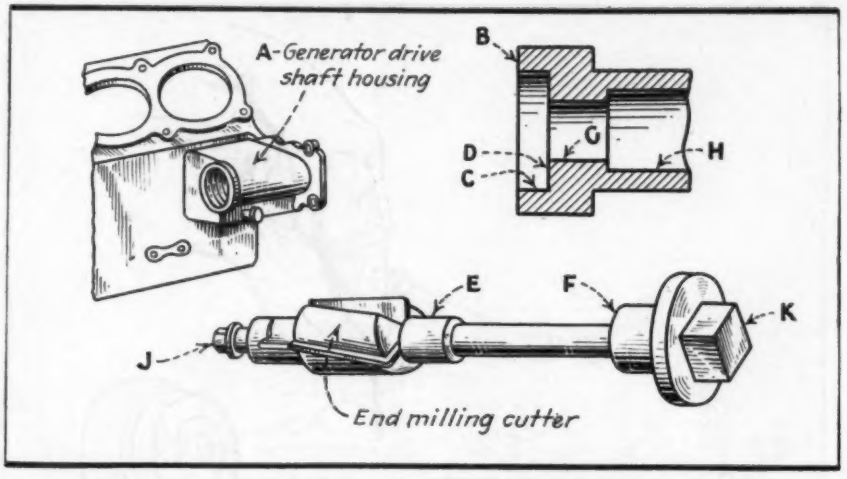
Hand-Operated Arbor Saves Machine Time

BY JONAS WOODCOCK, Packard Motor Car Company

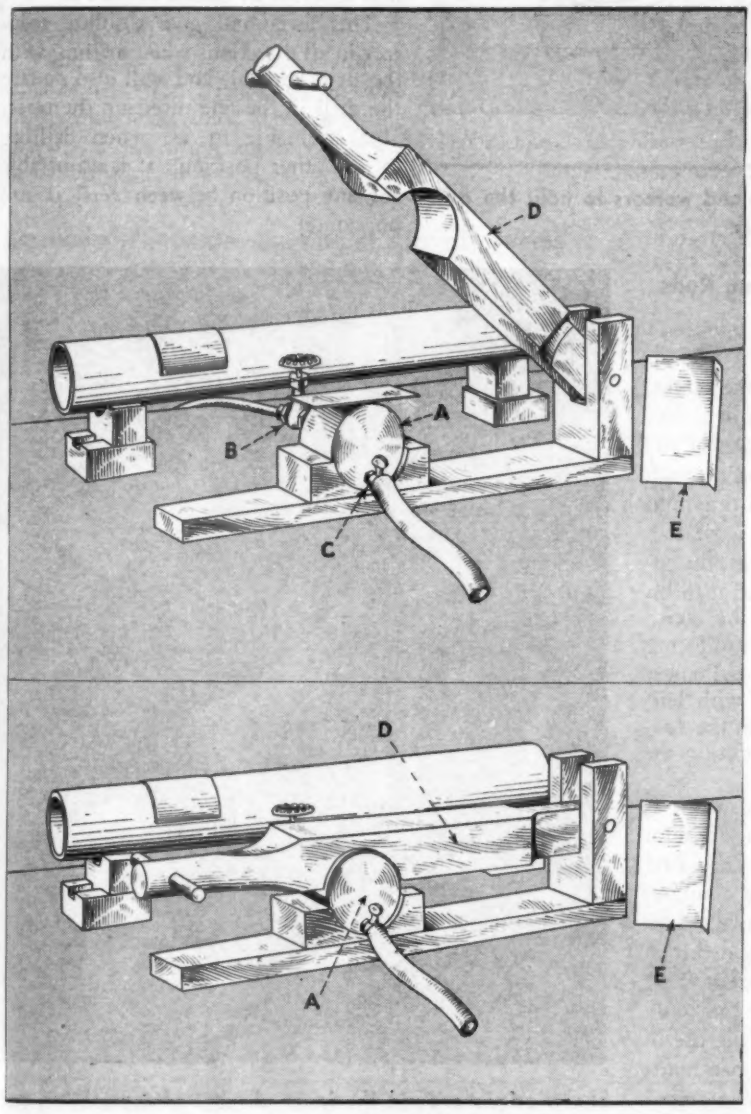
The upper crankcase casting of the Rolls-Royce engine includes housing *A*, which holds the generator drive shaft. Outer face *B*, together with diameter *C* and face *D*, are machined simultaneously. The dimension from face *D* to the opposite end of the casting has a wide limit of plus or minus 0.010 in., which usually permits sufficient additional milling to remove imperfections. If the production tool was used in such cases, a corresponding amount of stock would be removed from face *B*. This face must be held to close tolerances because of its connection to the generator.

After machining face *B* at the end of the part so the

over-all dimension of the housing is exact, it frequently happens that face *D* has not been cleaned up properly. To avoid a change in tools on the production machines, such corrections were made on similar machines in the salvage department with a single end mill. To release these machines in the salvage department for other work, the illustrated hand-operated facing arbor was designed. Bearing surfaces *E* and *F* are snug fits in bores *G* and *H*, respectively. After being assembled on the arbor and nut *J* is tightened, the cutter is turned with an open-end wrench applied to square *K*. *War Winning Suggestion recognized as meritorious by the Board for Individual Awards, War Production Drive.*



This arbor faces the counterbore in a drive-shaft housing when it does not clean up properly during production machining operations



Plastic nameplates are formed around a steam cylinder and transferred hot to the pipe. They are shaped to the pipe upon cooling

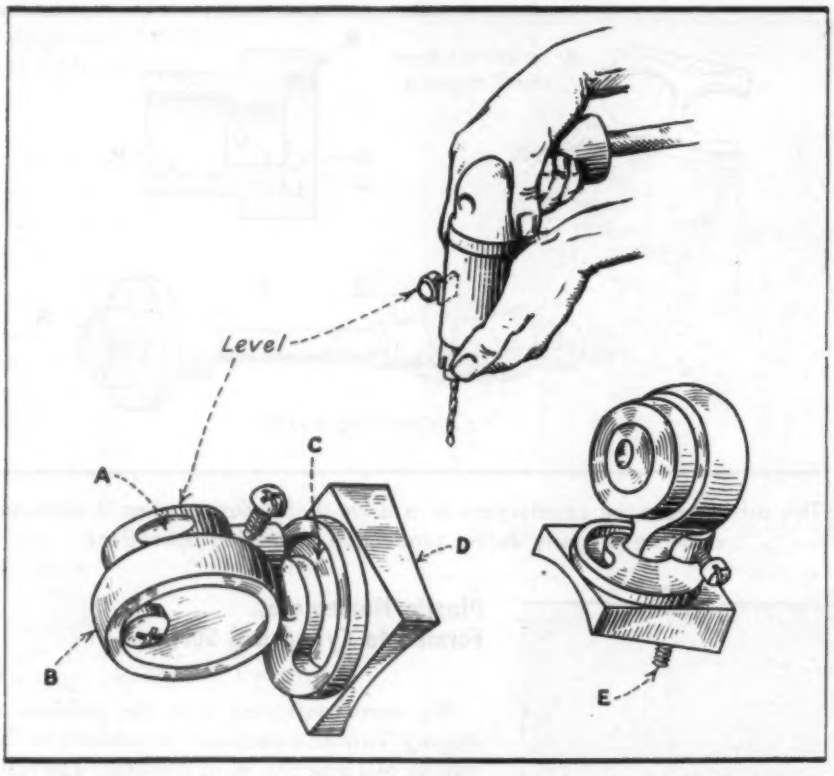
Plastic Nameplates Formed to Cylindrical Surfaces

BY WILLIAM O. JENSEN

We were confronted with the problem of shaping Vinylite nameplates to conform to the contour of a pipe 3¼ in. in diameter. The plate was 3⅛ in. wide and 5 in. long, and since this material is an acetate resin molded with heat and pressure, we found that a slight amount of steam applied to the surface made it plastic enough so that if placed immediately on a cold pipe it cooled to the proper shape. There were several thousand of these plates to shape, and it was essential that the printed face be kept clean. Several methods were devised to do this, each involving the use of the pipe as a mandrel. All proved to be unsuccessful.

The illustration shows a device that accomplished the desired results at low cost and required minimum skill for operation. Steel cylinder *A*, made from tubing, is plugged at both ends with welded plates. There are seven rows of ⅛ in. holes drilled in the top half of this cylinder, the rows being spaced ½ in. apart. Steam at 7 lb. per sq. in. pressure enters through valve *B* to heat the Vinylite nameplate. Condensation escapes through petcock *C* and drains through a rubber hose to a receptacle on the floor. This cylinder rests in a contoured block nailed to a wood base.

The nameplate is placed on top of cylinder *A* and wooden arm *D* is brought down to shape the Vinylite around the cylinder. Straight edge *E* is set on the top and side of arm *D*, and the nameplate is aligned to it. Valve *B* is then opened for 15 seconds. The valve is closed, arm *D* is raised, and the nameplate which remains on cylinder *A* is quickly transferred to the pipe to dry. The operator wears asbestos gloves to handle the hot plate.



The level, attached to the drill, helps inexperienced workers to hold the drill square with the work

Level Squares Portable Drills

BY F. W. FROMM

We had considerable trouble in drilling straight holes in aircraft subassemblies, because inexperienced workers lacked ability to hold the drill square with the work. Also, there have been many jobs where accuracy was of such importance that we have had to use three men to operate the drill, one drilling and two squaring the drill. Because of these factors, I devised the illustrated circular level which is attached to the drill motor.

Level *A*, inclosed in case *B* can be turned in slot *C* and locked in any desired position. Case *B* is fitted to masonite block *D* that is contoured to fit the drill motor housing, to which it is attached by means of stud *E*.

This level will give absolute accuracy in all directions when drilling with the drill vertical, and will also square the drill in the one direction the operator is unable to see when drilling in any other position. It is adjustable for any position between vertical and horizontal.

Emery Disks Break Sharp Edges on Connecting Rods

BY ELBERT S. BRINK
Cadillac Motor Car Division, General Motors Corporation

An emery disk, slitted from the edge towards the center, can be placed on the arbor of a portable air motor or a drill press to break the sharp inner edges around the holes of airplane engine connecting rods. The disk is pushed through one side of the crank pinhole into the fork, and thus into contact with the inner edge. When the machine is started, the disk spins and is forced into closer contact with the inner edge of the crankpin hole, and since it is slitted it forms a cone. Continued rotation of the disk causes the coned emery disk to cut the sharp edge on the hole, producing the necessary chamfer on the inner edge. The slitted emery disk is held on the drill press spindle by a nut with left-hand threads. The disk is fed through one hole in the connecting rod, which is then turned over for chamfering the second hole.

This simplifies a rather difficult operation, because it is almost impossible to place a tool inside the fork to chamfer or break the inner edges. It was formerly done by threading strips of emery paper through the fork and one crankpin hole, and oscillating them by hand. Trials were made with special tools that would slide in the fork and then turned with a handle through the crankpin hole; however, these were not successful, since an even and smooth cut could not be obtained. Time savings effected through the use of slitted emery disks have been estimated as 9,000 man-hours annually. *War Winning Suggestion recognized as meritorious by the Board for Individual Awards, War Production Drive.*

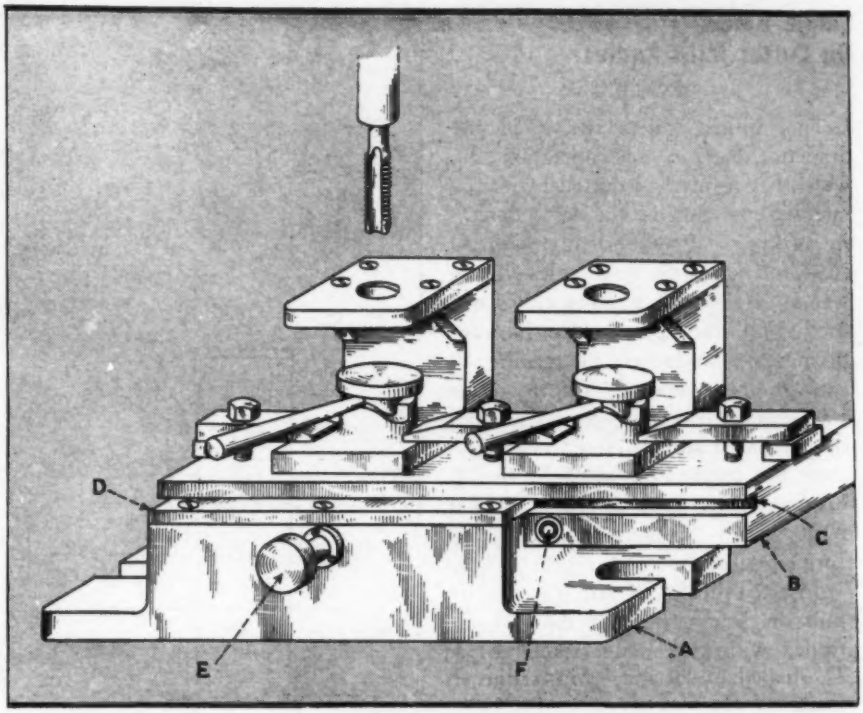
Sharp edges around the inner corners of connecting rod crankpin holes are easily broken by rotating slitted emery disks in the holes

Sliding Fixture Expedites Tapping Operations

BY PETER L. BUDWITZ

The illustrated index-type sliding fixture, incorporating the principle of dual jig mountings, can be used for expediting tapping operations performed on vertical leadscrew tapping equipment. It has time-saving features, since loading and unloading of workpieces can be done during the tapping cycle on production jobs.

A large die-holder is used as base *A* of the fixture. Slide *B* is machined with grooves *C* for a sliding fit of retaining plates *D*, and slides on ways machined on base *A*. Stations are located accurately by pull-type index lock pin *E*. The fixture slide has two hardened steel bushings *F* for receiving the index pin. Various clamping arrangements can be utilized on slide *B*, the design of which depends on the shape and size of the parts which are to be tapped.



This sliding fixture used on leadscrew tapping equipment permits loading and unloading of workpieces during the tapping cycle

Cerrobend Eliminates Denting of Aircraft Tubing

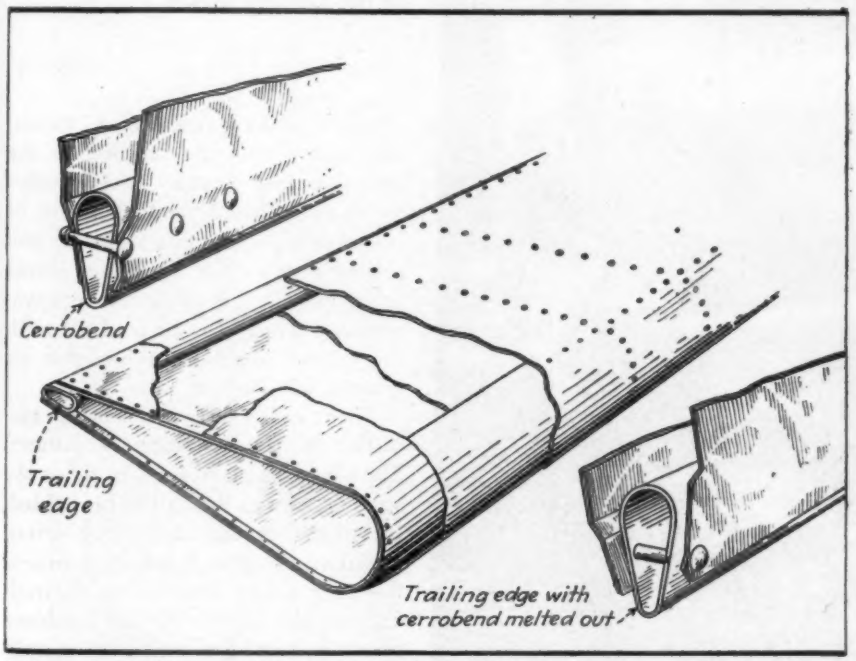
BY MICHAEL C. SEGUIN, Curtiss-Wright Corporation

Cerrobend can be used to strengthen and support thin-walled tubing and hollow extrusions used in trailing edges of airplane ailerons, rudders and outboard flap trim tabs during drilling and riveting operations. This not only prevents denting and warping of the tubing, but also permits greater pressure to be applied to the rivets, thereby producing a tighter joint and permitting the rivets to conform more precisely to the contour of the trailing edge.

Present practice is to pour a few drops of oil in the tubing to aid in later removal of the Cerrobend. The part is then set upright in a pan containing ½ in. of cold water. Melted cerrobend is poured into the tubing, the first ½ in. solidifying as soon as it hits the water. After filling the tubing, and the Cerrobend is cold, the part is drilled and riveted as if it were a solid bar.

After the trailing edge is assembled, including the tubing filled with Cerrobend, it is submerged in a tank of hot water to melt the Cerrobend. The tank is equipped with steam pipes to maintain the water at 200 F. The assembly is inserted in the tank at a slight angle to allow the melted Cerrobend to pour from the tubing into a small pan so that it can be recovered and used again.

This practice has reduced the reworking of aileron and trim tab trailing edges to less than 1 percent of total production. Such reworking ran one time to 50 percent. *War Winning Suggestion, Board for Individual Awards, War Production Drive.*



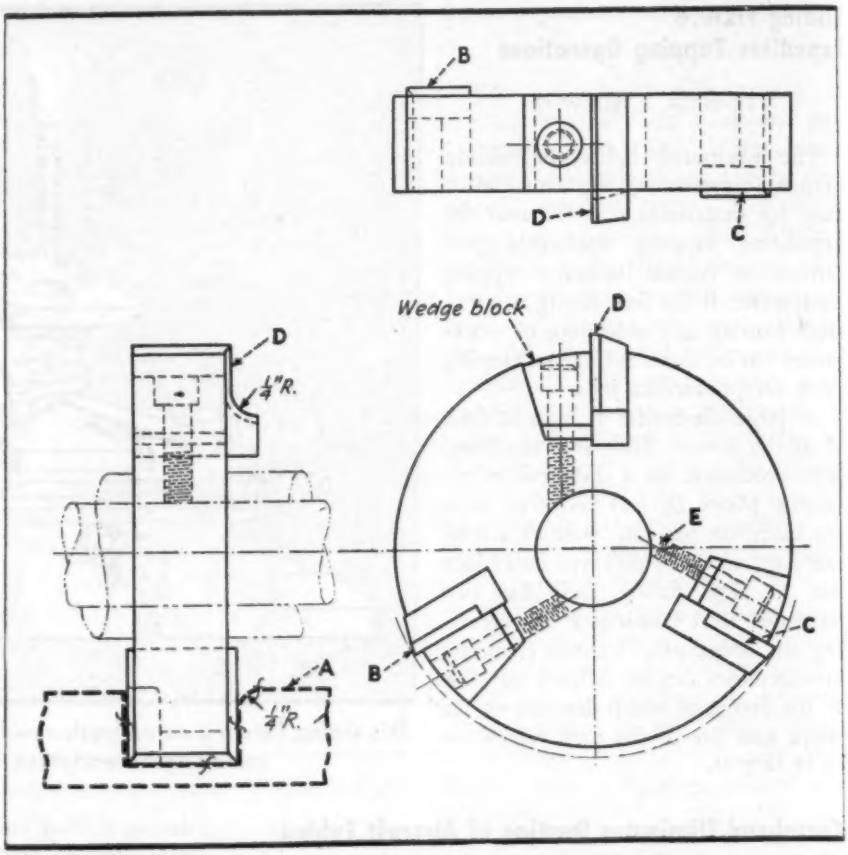
Thin-walled tubing used for trailing edges will not dent or warp during drilling and riveting operations if first filled with Cerrobend. The alloy is melted from the tubing when the assembly is completed

Single Blade On Cutter Mills Radius

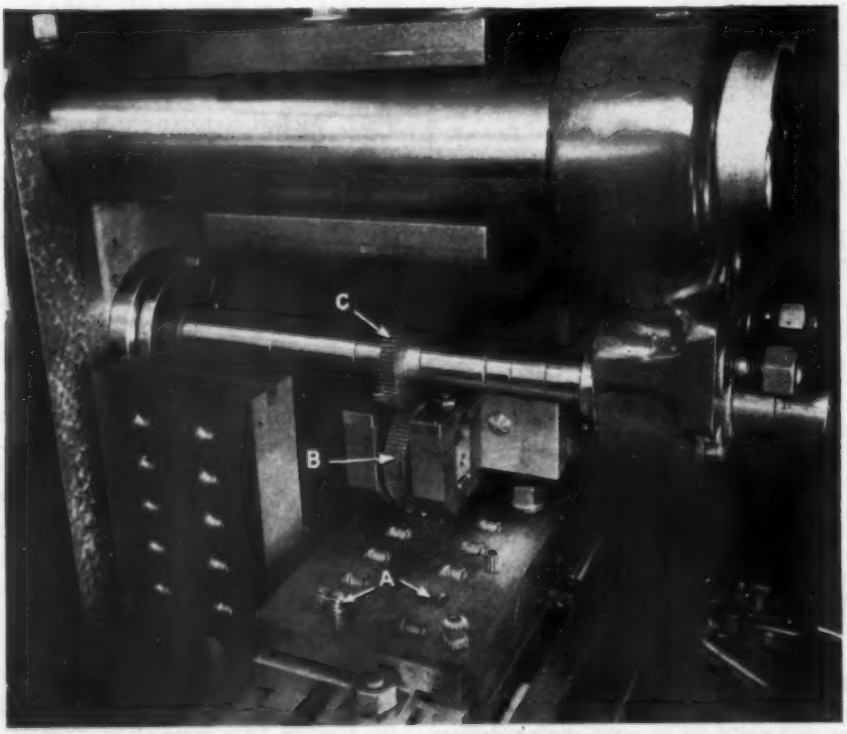
BY EDWARD LAY

The milling cutter shown in the drawing does in one operation the work that formerly required two separate set-ups; that is, the cast opening in workpiece *A* was milled straight to close tolerances on three sides in one set-up, after which a radius cutter was used to mill the ¼ in. radius. In order to increase production by making all cuts in one operation, a form cutter was requested. Since one could not be purchased and delivered in time to meet the production schedule, the illustrated cutter was designed. It was built within 24 hours, and has performed satisfactorily for over a year.

Inserted blades *B* and *C*, used to mill the square sides of the slot, are tipped with cemented carbide. Blade *D*, shaped to cut the ¼ in. radius, is made of high-speed steel, this being necessary since no diamond wheel was available to grind the radius on cemented-carbide tipped blanks. The cutter is so designed that the undersides of the blade wedge blocks never touch the bottom of the recesses in which they are held by screws *E*.



Two of the blades in this cutter mill the square sides of a slot in the casting, while the third blade forms the ¼ in. radius



Cavities in this die-casting mold are finished by a hardened cutter driven by an idler gear. This eliminates hand finishing operations

Eliminates Filing Of Die-Casting Molds

BY G. RUFENACHT
Westinghouse Electric & Manufacturing Company

When making die-casting molds, each cavity must be finished to the same degree of accuracy as every other mold. This often requires hours of laborious hand finishing with files and polishing sticks. The illustration shows a method which is quick and inexpensive, and which may be used for milling to final size those cavities that are symmetrical about an axis.

The cavities are first rough machined in the conventional manner. Then hardened cutters *A*, made to the same contour as the part to be molded, are placed in the cavity and driven through idler gear *B*, which in turn is driven by gear *C* mounted on the milling machine arbor. As the hardened master is turned in the cavity, it mills the cavity to the correct dimensions, and no hand finishing is required. The wear on the idler gear is negligible.

Armament

SECTION OF AMERICAN MACHINIST

Conveyors Help Build Bombsights On Schedule

By application of automotive mass-production methods, AC Spark Plug Division of General Motors has been able in a comparatively short time to manufacture thousands of bombsights under Lend-Lease contract

Efficacy of conveyors to speed mass-production of bombsights can be seen along the main assembly line. Operators remove inspected subassemblies from the conveyor behind the bench, locate and dowel them to the die-cast frame of the T-1 computor, according to a picture routing placed at each station. Assembly is speeded by surface-plate bench tops

IT IS A SAFE ESTIMATE that the AC Spark Plug Division never built in peacetime a product one-tenth as complicated nor requiring as much precision as the British T-1 computor, or predictor-type, bombsight. Yet today the manufacturing program for the bombsight is in such shape that the AC management can devote technical skill and floorspace to additional war contracts and heed government instructions to increase output of automotive replacement parts sorely needed to keep America's reservoir of passenger cars and trucks in repair.

Reasons for this success go deeper than installation of one-third mile of conveyor in the assembly space. Conveyors after all are merely one of the more spectacular aspects of mass-production technique—that is, always to have on hand a sufficient quantity, but no more, of satisfactory material at the right places. What that means in respect to reaching quantity production for a foreign bombsight can be disclosed by analyzing some of the features of the device and what AC Spark Plug has accomplished.

The T-1 computor meets British requirements for night bombing, wherein low-level attack and evasive tactics dictate a sight that instantly tells the bombardier where his missile will land regardless of the manner in which the plane must be flown—up, down, turning to right or left, faster or slower. With such a sight the bombardier and the pilot can maneuver the plane in any manner until the instant the target is under the sight's crooshairs and the bomb-release button can be pressed.

As designed by British scientists the T-1 computor was a "model shop" creation, embodied 1120 parts, weighed 85 lb., made use of iron and steel rather than light metals, incorporated some metal parts that were extremely difficult and tedious of manufacture. AC was handed blueprints eight days before Pearl Harbor, made new drawings to American standards, produced experimental sights and set up a system of manufacturing tolerances, reduced the weight 35 percent and the parts to 840 and made the first production sight ten months later. Since then, thousands

To avoid the chance of uninspected material reaching the assembly floor, a "postoffice" system is used for transferring twelve purchased subassemblies to receiving inspection. As the components are unpacked they are placed in an appropriate special wood tray

Purchased subassemblies are 100 percent inspected for proper functioning and dimensions. Here the two inspectors make more than 40 checks upon the double-angle servo, the device which operates the sighting head of the bombsight. Inspectors are specially selected from aptitude tests for concentration, dexterity, intelligence

of sights have been shipped out of Flint, and the management asserts that this rich experience has given birth to new ideas that will result in improvement of numerous automotive products and new products as well.

Subcontracting for a Purpose

Perhaps the most significant step that AC took in setting up for manufacture of the bombsight was to engineer all of the twelve functions in the device into subassemblies. By so doing, each subassembly can be set up, tested and shipped as a unit—thereby permitting subcontracting on an ever-expanding scale. At present over 50 percent of the sight is manufactured outside the AC plant, and more work is being let out as fast as AC engineers can perfect the tooling for certain parts and release the equipment to subcontractors. This policy is progressively releasing supervision, floorspace, equipment and labor for either additional war contracts requiring maximum skill, or resumption of necessary production of automotive products. For it was realized many months ago that consistent with government orders for military products, the company should make every effort to set its house in order to accommodate production of replacement parts, when materials became available. Now when it looks as though Washington may approve production of up to $500,000,000 worth of replacement parts in 1944, AC stands in a relatively good position to supply its proper proportion of the business.

Thus to a large extent AC now operates as an assembly plant for the T-1 computor. Parts production remaining at Flint is spread throughout several departments, but the actual assembly work is concentrated in one area where maximum cleanliness is assured by departmental layout, shop regulations and use of filtered air.

Material for the T-1 computor flows into the assembly department at two points: (1) subcontracted parts are unpacked in a receiving room at one end, (2) at one side of the building, trays of AC-manufactured parts are delivered to racks adjacent to subassembly benches placed at right angles to the subassembly conveyor.

The subassembly conveyor is the monitor for the shop. On its 1200 ft. circuit is carried material for

approximately three days' production. Condition of the subassembly conveyor provides a visual check of stock on hand, departmental results, number of new hires that foremen must requisition. Nothing may be stored on the floor, on benches or under benches. This system promotes exceptionally tidy housekeeping, which is essential to assembly of a precision product.

Subcontracted parts (AC engineered subassemblies) are received in cellophane bags, packed in cartons to avoid damage in shipment. As the bags are unpacked they are placed in special wood containers and slid onto the shelves of a "postoffice." This constitutes a barrier between the receiving department and incoming-material inspection to avoid the chance of parts getting onto the subassembly conveyor without examination by AC inspectors.

AC inspectors thus examine all vendor-produced parts, and if perfect, write an O.K. inspection tag. The part in its wood container can then be placed on stock shelves placed at right angles to the subassembly conveyor. If defects are found, the part may be repaired by a trained crew, or returned to the vendor. A stock of repair parts, purchased against a "minimum and maximum" schedule is maintained at the inspection station.

The use of a repair crew at this point has a number of advantages:

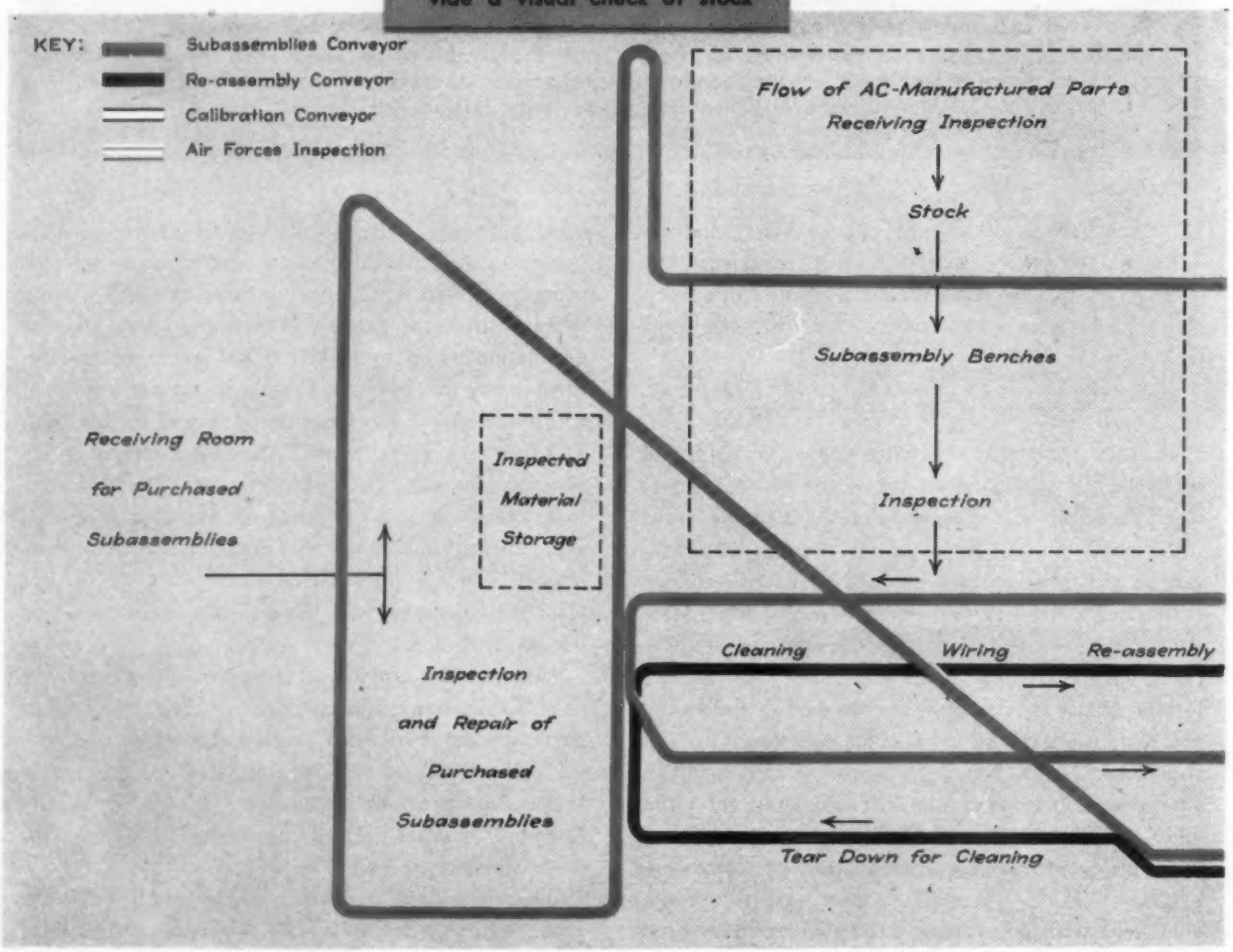
1. Minor repairs can be made quickly, for example, replacement of a loose pin, so that the part is made serviceable and need not be returned to the vendor—a costly and time-consuming step.

2. Each defect is listed on the AC inspection ticket, providing a record that is useful in overcoming the difficulty with the vendor.

3. If defects follow a certain pattern, AC contact men can take up the matter with the vendor and perhaps assist him in overcoming manufacturing or inspection troubles. Or a change in standards may be agreed upon.

4. Material requiring major repairs, or involving serious variations from quality standards, is culled and it is either taken to the vendor or he is called in to discuss the matter. AC believes that teamwork between a prime contractor and his subcontractors is best achieved by personal ac-

Conveyors save much space and labor in assembly of the T-1 computor at an AC Spark Plug plant. No material may be stored on or under benches nor upon the floor. Conveyors promote tidy housekeeping, store material in process, provide a visual check of stock



quaintanceship of responsible people on both sides, and a mutual understanding of shop and engineering problems.

5. Serious repairs can be made promptly if the part is urgently needed.

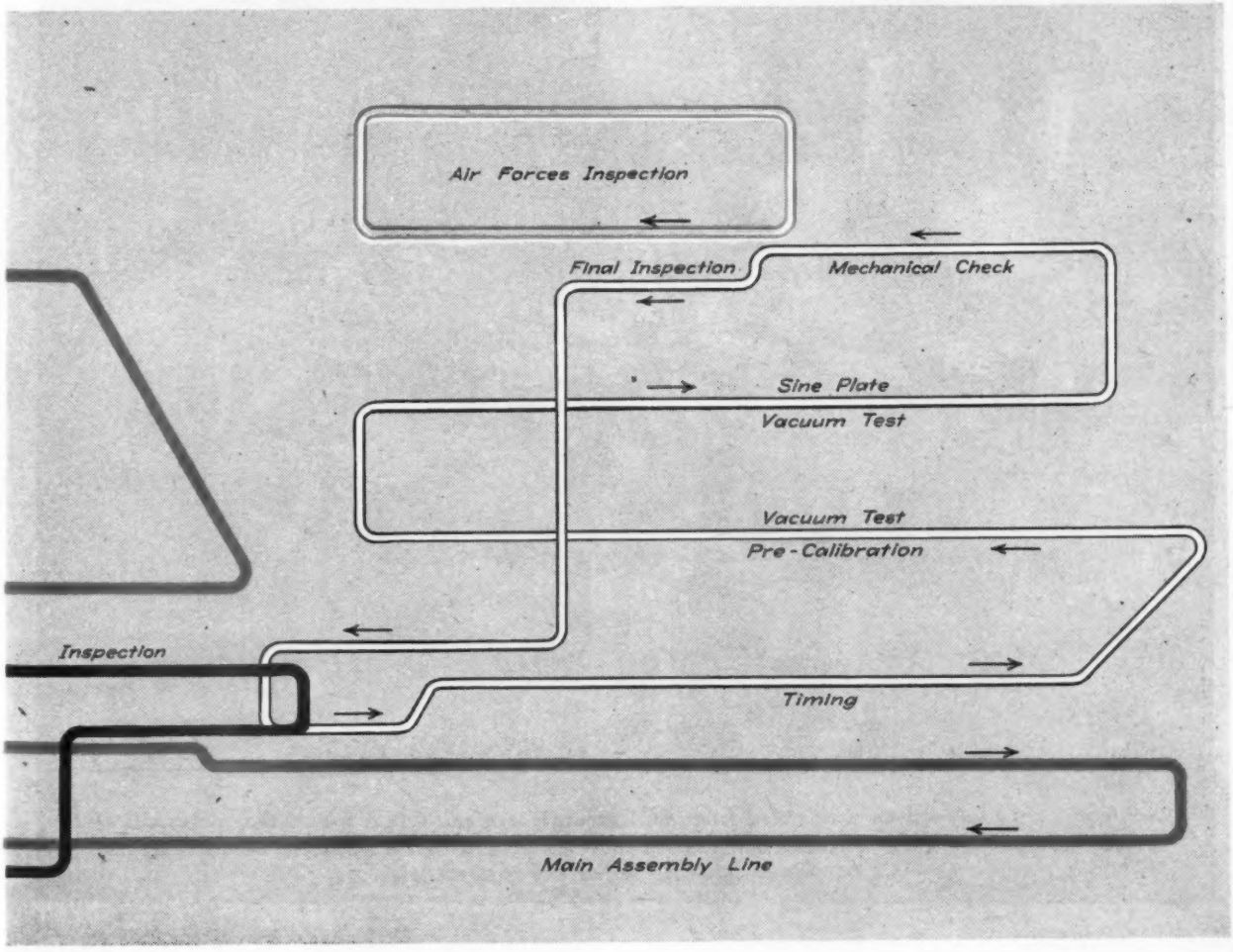
Approved subassemblies are stored on shelves placed at right angles to the subassembly conveyor. Stock loaders transfer the boxes as required to the conveyor hangers, which have three trays. The middle and lowest trays always receive the same groups of containers: the contents of the upper tray may be varied according to a code system placed on a chart at the loader's station. To prevent disbursement of old stock the parts are color-marked to indicate month of manufacture. By watching the chart, the loader maintains proper turnover of stock, thereby keeping up to date with respect to engineering changes. It should be noted, however, that the stock of vendor-supplied equipment does not amount to many days' supply.

Wood containers for subassemblies are noteworthy for quality and finish. AC plant engineers made up samples, obtained bids, and the contract was placed with a furniture manufacturer who not only gave an attractive price but was able to suggest many improvements in construction and quality. The smooth shellacked surface of these containers is of value during periodic dusting—which is required even though filtered air is supplied to the assembly room. The appearance, finish and well-cut finger grips of the containers have important advantages in winning the respect of women operators for their work surroundings and the importance of careful treatment of the product.

Stock Maintained at Minimum

AC-manufactured parts are delivered to subassembly stock racks in wood containers. The bank of parts naturally depends upon machine efficiency, production rate, set-up time involved in making a specific item. But the program is "never to have anything ahead, and never run out." So about two to three days' supply is carried.

Originally it was thought necessary to have a tray for every part, and some 75 different models were considered. As time went on, it was learned that a relatively few trays would easily take all of the various parts. In other words, trays with a given



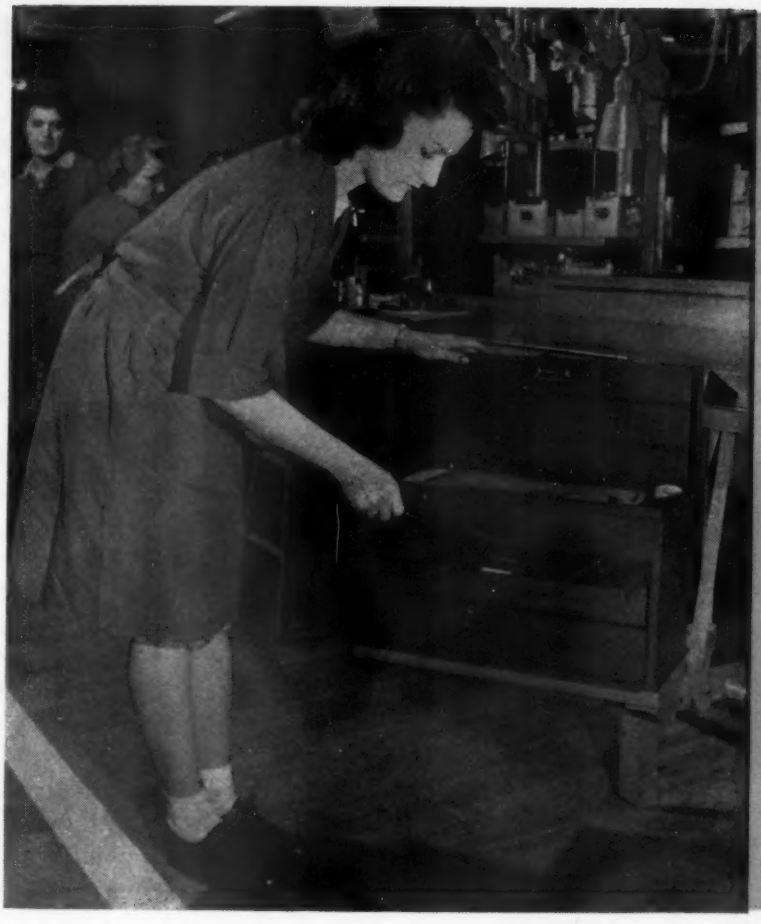
size partition may carry a number of parts of different diameter. Or more than one short shaft may be laid end to end in a partition. Similarly, trays with holes may be used to transport small pins or small shafts with an integral gear. The main thing is to give a tray sufficient depth to carry a number of different pieces safely. Then if the number of partitions, holes, or pegs is known it is an easy matter to take a visual inventory of the contents, regardless of what the piece happens to be.

Every Part Must Be Inspected

When AC operators complete a subassembly it is turned over to an inspector, who O.K.'s it and puts it on the subassembly conveyor, which drops down to a convenient height. If trouble develops during assembly, the defective part can be traced to the inspector and subassembly crew at fault. There is no attempt to criticize employees. The main objective is to find out the reason for the defect—either in method, insufficient training, or some personal reason why either the inspector or the operator is not suited to the work. Much of AC's use of aptitude tests in selection of employees has centered around people chosen for assembly operations on the bombsight. This activity has paid good dividends in fitting people to the job and reducing turnover, but obviously on-the-job experience may show up some weaknesses in the operator's capabilities.

In addition, the assembly department is responsible for a satisfactory product, whether the part is to print or not. Any trouble with a part may call for a conference between assembly, parts production, engineering and inspection groups. The result may

Trail cams are progressively assembled from AC-manufactured parts in a set-up that is typical of several subassembly lines. Finished components must be passed by an inspector before they can be placed upon the subassembly conveyor



Nothing may be placed on the main assembly bench, except work in process and tools actually in use. Toolboxes on swing stands hold the purses, safety equipment, tools not in use for two operators, are swung under the bench when not in use

be a change in processing method or tooling, or in the part itself, benefiting all those concerned.

The loaded subassembly conveyor passes just behind a progressive assembly bench, where the components are fitted into precise relationship in the main-base casting. The first step here is to locate the main-base casting in a fixture so that the center pick-up hole is at the correct height with respect to the surface plate on which the fixture rests. A three-point setting gage is applied for this purpose. By its use the center hole is set within 0.0003-0.0004 in. for height by one pin, and two other holes in diagonal corners of the base are picked up by two other pins, so that the part is aligned for squareness.

Squareness of the base casting in the assembly fixture is checked by traversing a dial indicator along the height-reference bar, or horizontal leg, of the triangular-shaped setting gage. After fastening the base casting securely with clamp screws, the twelve standard subassemblies can be progressively located with height gage measurements. Conventional dial indicators or adjustable height blocks (made adjustable to cope with engineering changes) are used. Surface plates installed as bench tops are sufficently accurate for the use of height gages, since they are made of heavy iron castings surface ground to a plane surface.

At each assembly station, there is an overhead picture-routing sheet which gives in an exploded perspective view the parts being assembled with their names and part number and also a perspective of the finished job at that point, the subassembly in question being shown dark while previously installed subassemblies are shown in phantom. A list of operations required at the assembly station is also shown.

Toolboxes are provided on hinged stands that swing out of the way under the bench. These toolboxes provide room for storing the purses of two operators and all necessary tools. Operators are encouraged to keep only the tools they are using in neat array on top of the bench. Thus, the operator is not distracted from her exacting tasks by the need to search through a miscellaneous group of tools.

AC Drillpress Aids Assembly

It is of course necessary for operators to reach across the bench to remove needed subassemblies from the subassembly conveyor. This circumstance restricts the desirable bench width to 24 in. On the other hand, small drills are necessary for putting in dowel-pin holes to locate the subassemblies in the base. No commercial drill press with the necessary compactness of column and length of stroke (6 in.) was available. Hence AC developed its own device, which consists

of a drillhead and short round column fastened to an overhead frame. To obtain the rapid drop required, a handle (at left) rides on a cam. By grasping the handle, the cam shoe is released and the head drops 4 in. Then by using the right-hand sensitive feed lever, a feed up to 2 in. is secured.

Since small drills are used, and slow speed and low torque are required, the actual drilling is done by a small Black & Decker "HolGun". It should be noted also that when the drillhead is dropped, a light is turned on and power is applied to the drill motor. An upward flip of the left-hand handle, after the hole is drilled, returns the drillhead to the up position, where it is held safely by the cam shoe. Since the column of the machine is cut off several inches above the bench, no interference is created when the fixture is laid on its side and a hole must be drilled near the center of the product.

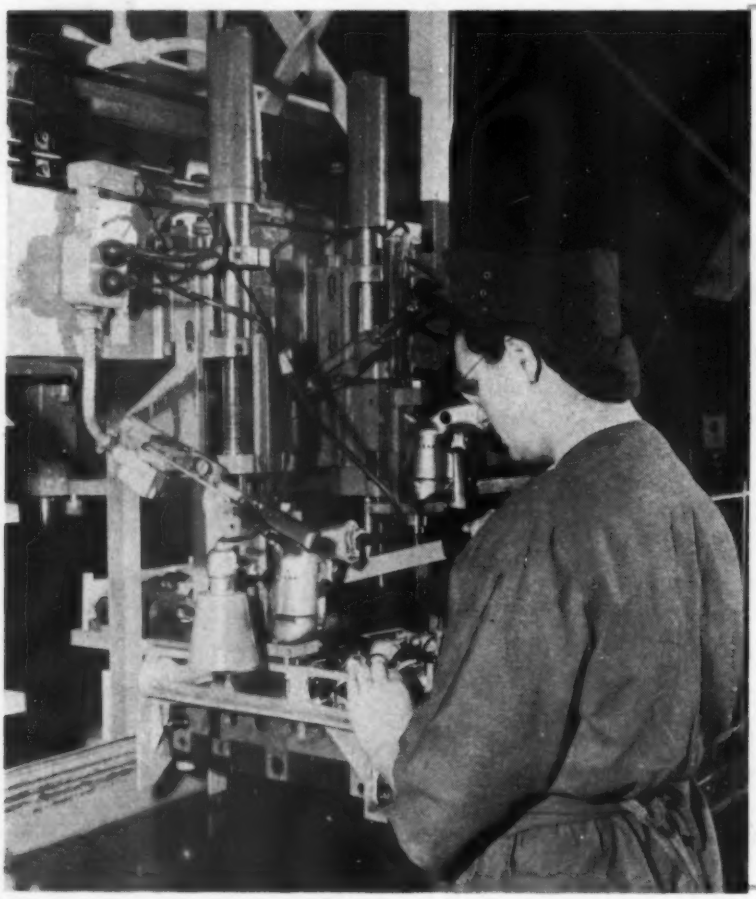
Dowel-Pin Drilling

The drilling of dowel-pin holes is a critical operation. The pin must not come loose, yet the force to drive it must not distort the aluminum base casting. Hence the hole is first drilled with an 0.055 in. drill and then reamed to 0.0625 in. with a reamer for which the specifications are 0.0625 in. diameter, + 0.0000 in., —0.0002 in.

For easy removal of the subassembly from the dowel-pin, the latter is stepped. The smaller diameter is made 0.0002 in. undersize by swaging or polishing.

The grinding of small drills so that they cut true and produce holes of the correct size is a problem. The machine used for the purpose is not original with AC but deserves mention. The wheel spindle revolves in widely separated bearings which are of the oil-impregnated wood type. With a belt drive and these bearings, exceptionally smooth operation is obtained. Naturally in work of this character, each reground drill is tested by drilling a satisfactory hole, before it is released by the toolcrib.

After all subassemblies have been located and doweled to the base casting, it is obvious that chips must be removed, likewise the cutting oil used to save the drills. Therefore the assembly is torn down, and all components are placed on an empty conveyor hanger for transportation to a degreasing cabinet. Here petroleum solvent is sprayed on the parts and they are blown off with filtered compressed air. Solvent is distilled before re-use. Hence clean solvent is always sprayed over the work.



Width of the main assembly bench is limited to 24 in. so that operators can reach across it to remove subassemblies from the conveyor at rear. To avoid using vital bench space for a drill base, AC developed a special ceiling-mounted drilling machine, which combines a rapid drop of 4 in. (with handle at left) and a sensitive feed of 2 in. (with handle at right). Dropping the handle at left operates a microswitch that turns on the motor and a light

Distilled petroleum spirit (Stanisol) is sprayed upon the components of the bombsight to remove oil and chips. Solvent adhering to the parts is blown off with filtered compressed air

Reassembly of the bombsight is carried out in a fixture that is fastened to a turntable base. In the assembled state the bombsight weighs too much for a woman to lift. Therefore the fixture has a hinge at one lower edge, so that the assembly can be swung to the horizontal position and released upon the roller-mounted skid at left. The skid permits installation of the tubular shock mount

Re-Assembly Requires Concentration

The first step in final assembly is fitting the wiring harness, a stock item, into the baseplate. Reassembly of the subassemblies onto the base follows. This work requires constant concentration, and only girls possessing this ability, as revealed by aptitude tests, are chosen.

Final assembly operations are carried out with the base located in a fixture that is supported on a turntable and hinged at one lower edge. When all subassemblies have been fastened in place, the fixture is dropped to the horizontal position, and a wheeled fixture is slid underneath. The computor is released onto the fixture for application of the tubular shock mount. This combination of fixtures avoids the need for lifting the assembly, which now is heavier than the maximum weight that women are permitted to lift under state law.

After assembly, the computor is released to an inspection station, where women check that all details have been incorporated and that adjustments are approximately correct. Then a dust hood is placed over the computor before it is transferred from the inspection bench to the calibration conveyor.

To raise the computor to proper height for gripping by a tong-like conveyor hanger, AC engineers have installed a piston-operated lift in a bench section. The inspector depresses a pedal which admits air to the cylinder, the bench section rises to the proper height, the tong is engaged with the tubular shock mount, and the operator takes her foot from the pedal, whereupon the bench section returns to the normal height.

Work Lift Saves Woman's Back

Calibration consists of several distinct operations: pre-calibration, vacuum testing, checking on the sine plate. These operations are carried out at stations adjacent to the conveyor. Computor assemblies are lifted off and put on the conveyor with an elevator that will lift to either of two heights as desired, for example, bench height or vacuum chamber height. Operators on given calibration tasks remove assemblies from the conveyor according to a color code system. A white ticket may indicate that the device has been pre-calibrated, a red ticket that it has been vacuum-tested. A given operator of course takes only those assemblies that have already been passed

by the previous operation, as shown by the ticket.

Pre-calibration consists of timing the computor. The operator affixes revolution counters to certain shafts, puts in 17 standard bombing problems into the computor, observes deviations in counter readings. She then makes minor adjustments in springs, levers, steel driving bands, as the case may be, so that counter deviations are overcome. The timing operation is essential because gear datum lines can not be set closer than 0.003-0.004 in. by assembly operators.

The "vacuum test" consists of placing the computor in a glass chamber in which air pressures corresponding to conditions from sea level to above 23,000 ft. can be accurately duplicated. The checks made consist of observing the results obtained at various "altitudes" when standard problems are run off, and making minor adjustments in certain functions of the device. The subassemblies supplied for these functions are tested by the subcontractor for scores of altitude situations, and the subcontractor's inspection record is enclosed in the inspection-ticket envelope for the information of the vacuum-test operator.

Importance of the inspection-ticket envelope in manufacture and testing a precision product can not be over-emphasized. All subcontractors inspection records and those of AC inspectors are progressively placed in the envelope as the assembly is built up and tested. If something wrong is found it is then an easy matter to trace the source of the difficulty and make any necessary corrections at prior stages, either parts manufacture or sub-assembly.

It is not expedient to discuss the testing of the T-1 computor in detail because the device is still a restricted item in a military sense. Enough has been said to indicate that precision equipment and highly trained operators are required. When the computor is fully calibrated, a final mechanical check and inspection are employed before release to Air Forces inspectors. Government personnel are supplied with accurate testing equipment identical with that used on the AC line. Plant management is proud of the fact that the repair line at final inspection is seldom used, and rejections by military inspectors are rare.

After general inspection of assembly operations, the computor is lifted from bench to conveyor hanger by means of a piston-operated elevator. The conveyor transports the assembly to stations where the instrument is calibrated to known standards of operation

Flawless calibration is indispensable to avoid nullification of the bombardier's efforts. Here revolution counters are attached to shafts. The operators put 17 standard problems into the computor in sequence, watch the counters, make minor adjustments to steel driving bands and levers because gear-datum lines have been set previously to only 0.003-0.004 in.

Hole Quenching Stops Breakage Of 40-mm. Cartridge Die Rings

BY WILTON F. HOAG

Up to 100,000 impressions made with header die rings quenched in special fixture. Tangential compression offsets loading and unloading reactions of process

BREAKAGE of the header die ring, used in a six-station indexing unit on the third drawing operation for 40-mm. shell powder cases, often occurred before an economical run could be obtained and ran so high as to interfere with production schedules. Space on the machine was limited, so the rings could not be increased in size to overcome the difficulty.

Originally the rings were made of deep hardening steels that were uniformly hard all the way through. Drawing to as low as Rockwell 45C did not stop the breakage, so it was evident that the loading and unloading reaction of the heading operation was too much for the natural strength of the ring. Steels suitable for pack-hardening were tried, but rings of these materials shrunk from 0.02 to 0.045 in. at the outer ends of the holes, leaving the center of the hole with a barrel shape and making it several thousandths larger than the original bore. It was then found that the breakage could be stopped by hole quenching which created tangential compression stresses.

The special fixture for hole quenching consists of two platens, the lower stationary and the upper movable. Area of the inlet and outlet is 1 sq. in., the same as that at the restricted section of the filler plugs. The incoming water connection is at the bottom, where the ring's working face makes the most direct contact with the flow. Care had to be taken that no water got under the gaskets as cracking would result.

Clamping of the platens had to be rapid, so an air cylinder was used, although other means may be adapted. Approximately 900 lb. pressure is required and provisions are made to equalize as cooling progresses. Quick restriction of outlet flow is provided by another fixture, shown in Fig. 6.

Steel selected for rings used with this fixture was of the water-hardening type with shown percentage of the following alloying agents: carbon, 1; manganese, 0.65; chromium, 0.50 and vanadium, 0.20.

Heat treatment for each ring adhered rigidly to this procedure: One ring at a time is charged into a cold furnace and brought up to 1,550 F. in 2½ hours maximum. This temperature is maintained for one hour. The ring is turned over five times, the first when passing through the critical temperature and thereafter at regular intervals, finishing, for the last 5 min., with the working face down. The ring is quenched in this position. It is also turned 180 deg.

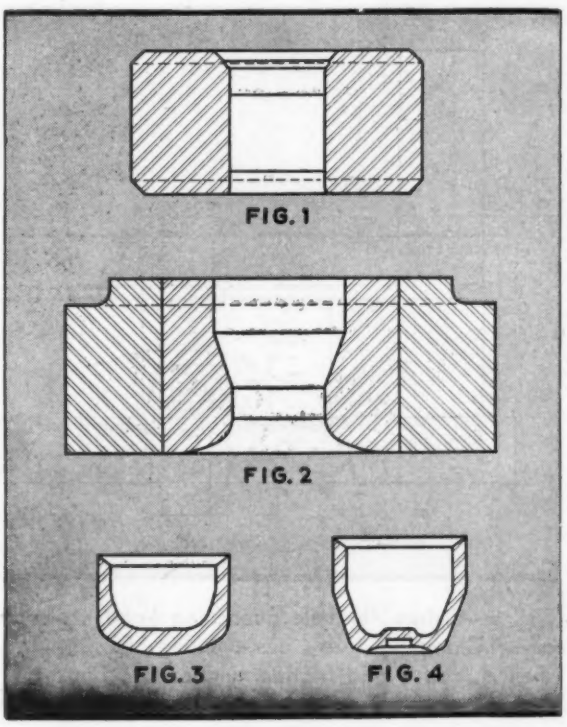


Fig. 1—Header die ring used in six-station indexing unit for heading powder cases of 40-mm. cartridges. Fig. 2—As 2 in. of metal around the hole is the maximum for hole quenching, a two-piece ring is used. Fig. 3—Original shape of cartridge case before heading operation. Fig. 4—Shape of cartridge case after the heading operation

every 5 min. after passing the critical point to assure uniform saturation.

A semi-muffle gas furnace is used and the atmosphere maintained to result in a scale so soft and friable that the quenched surfaces will be clean and of uniform hardness.

Eight Variations Tried

Eight rings were made with variations in heat treatment. Four were quenched by an unrestricted flow through the fixture until cold on the outside in still air. They were drawn at 430 F., one each for four, three, two and one hours.

One ring was quenched in brine in the conventional manner and resulted in the same general shape as those which were carburized. This ring was given two draw periods of 450 F. each, cooling to room temperature between each draw. Each draw period was three hours. Although the tension stresses in this ring were nearly neutralized it did not give economical service.

Another ring was given a full flush of 45 sec. after which the outlet was restricted so that temperature of outcoming water was 212 F. This resulted from some of the heat in the rest of the ring running back through the section already hardened, resulting in a drawing reaction. This step is important and must be gaged with a thermometer. The hole in this ring was straight and 0.002 in. under the original bore. After drawing at 212 F. for 21 hours it was found to have closed in 0.003 in. more. This was interpreted as an indication of high tangential compression, which would aid in resisting the bursting stresses of the heading operation. This ring proved most satisfactory of all those prepared. The other two rings were given flushes of 30 and 45 sec. with temperatures of outcoming water 180 F. and 210 F. respectively. No draw was made.

Holes of all rings quenched in the fixture were straight. Water pressure was 30 lb. per sq. in. Hardness of metal surrounding the hole varies from Rockwell 60C to Rockwell 66C, depending upon the draw. By experience it was found that if the thickness of the hard layer surrounding the hole exceeds 3/16 in. the ring will break quickly.

Since approximately 2 in. of metal around the hole is the maximum for hole quenching, the die is made in two pieces. The inner ring is given a 45 sec. flush, outcoming water raised to 200 F., no draw. The outer ring is chrome-vanadium steel, carbon, 0.50; manganese, 0.60; chromium, 1.00 and vanadium, 0.20 percent, quenched in water from 1,550 F. drawn at 700 F. for three hours to Rockwell 45C. All surfaces are ground to a high finish before assembly.

Over 100,000 Impressions Made

All work is done at room temperature and requires approximately 1,000 ton pressure. The inner members give in excess of 100,000 impressions before being worn out and then can be renewed.

This die is used to reshape cups from that shown in Fig. 3 to the shape in Fig. 4.

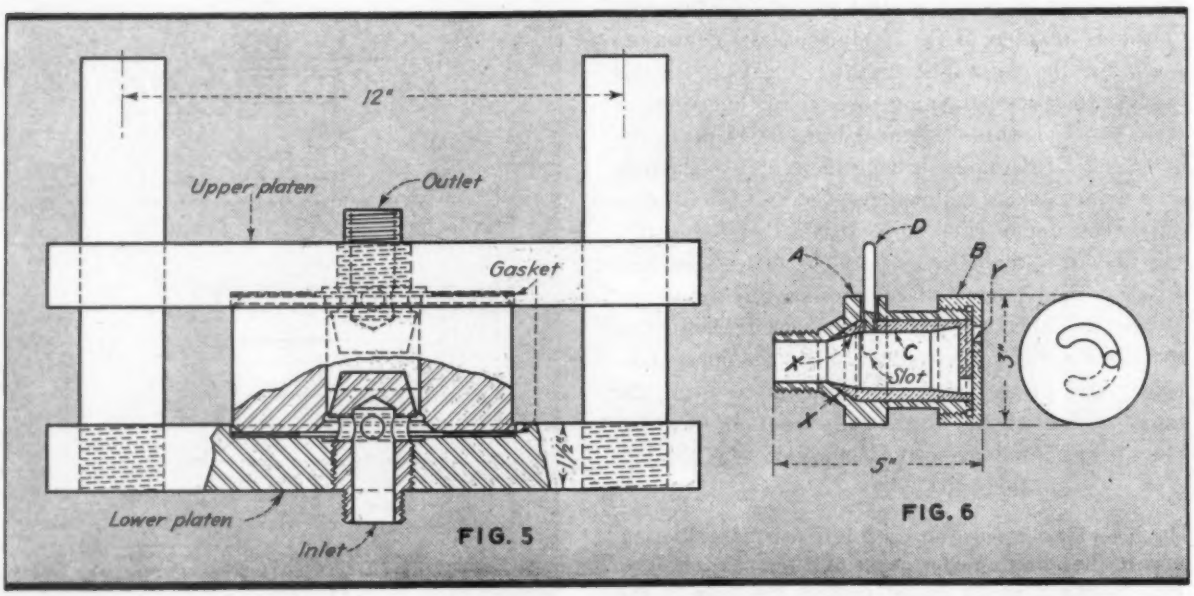
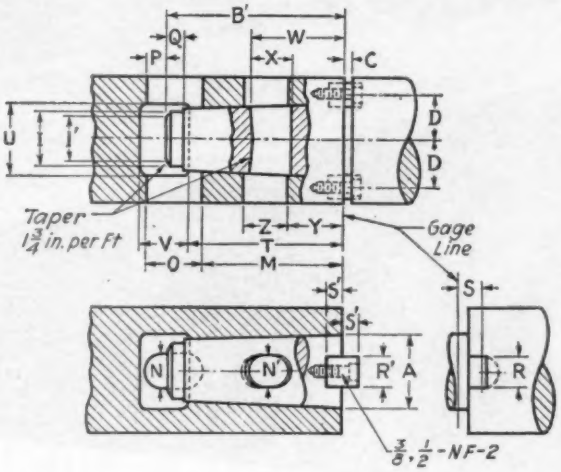


Fig. 5—Fixture for hole quenching header die rings. The upper platen is movable and the lower stationary. Clamping is by air cylinder. Fig. 6—The outlet flow restricting fixture consists of three parts: shell *A*, cap *B* and friction number *C*. The latter is held from turning by friction on surfaces *X* and *Y*. Handle *D* controls opening of the fixture

Machine Tapers III



Tolerances

FOR DIAMETER OF SHANK AT GAGE LINE (A)
All sizes, +0.002 − 0.000
FOR DIAMETER OF HOLE AT GAGE LINE (A)
All sizes, + 0.000 − 0.002
FOR WIDTH OF KNOCKOUT KEYWAY (N)
+0.008 − 0.000
FOR WIDTH OF DRIVE KEYWAY (R')
In socket, +0.000 − 0.001
FOR WIDTH OF DRIVE KEYWAY (R)
In shank, +0.010 −0.000
FOR CONCENTRICITY OF KNOCKOUT KEYWAY (N)
With center line of spindle, 0.007
FOR CONCENTRICITY OF KEYWAY (R')
With center line of spindle, 0.002
TOLERANCES ON FRACTIONAL DIMENSIONS,
±0.010 unless otherwise specified

Table 4 Key Drive With Shank Retained by Key

No. of Taper	Shank								Drive Key		Holdback Keyway in Shank[2]		
	Diameter at Gage Line[1]	Length From Gage Line	Exposed Length	Length of Relief	Diameter of Flat	Diameter of Relief	Drive Keyway		Center Line to Center of Screw	Fine Thread Screw (NF)	Gage Line to Back of Keyway	Length	Width
							Width	Depth					
	A	B'	C	Q	I'	I	R	S	D		W	X	N'
200	2.000	5 1/8		1/4	1 1/8	1 5/8	1.005	9/16	1 13/32	3/8	3 7/16	1 9/16	0.656
250	2.500	5 7/8		1/4	1 1/8	2 1/16	1.005	9/16	1 21/32	3/8	3 11/16	1 9/16	0.781
300	3.000	6 5/8	Min 0.003	1/4	1 3/8	2 1/2	2.005	9/16	2 1/4	3/8	4 1/16	1 9/16	1.031
350	3.500	7 7/16		5/16	2	2 15/16	2.005	9/16	2 1/2	3/8	4 7/8	2	1.031
400	4.000	8 3/16	Max 0.067	5/16	2 3/8	3 5/16	2.005	9/16	2 3/4	3/8	5 5/16	2 1/4	1.031
450	4.500	9		3/8	2 3/8	3 13/16	3.005	13/16	3	1/2	5 7/8	2 7/16	1.031
500	5.000	9 3/4	for all Sizes	3/8	2 1/2	4 1/4	3.005	13/16	3 1/4	1/2	6 7/16	2 5/8	1.031
600	6.000	11 5/16		7/16	2 5/8	5 3/16	3.005	13/16	3 3/4	1/2	7 7/16	3	1.281
800	8.000	14 3/8		1/2	3 1/2	7	4.010	1 1/16	4 3/4	1/2	9 9/16	4	1.781
1000	10.000	17 7/16		5/8	4 1/2	8 3/4	4.010	1 1/16	...	...	11 1/2	4 3/4	2.031
1200	12.000	20 1/2		3/4	5 3/8	10 1/2	4.010	1 1/16	...	...	13 3/4	5 3/4	2.531

No. of Taper	Socket						Knockout Keyway[2]			Holdback Keyway[2] in Socket		
	Drive Keyway		Gage Line to Front of Relief	Diameter Relief	Depth Relief	Gage Line to Keyway	Width	Length	Shank End to Back of Keyway	Gage Line to Front of Keyway	Length	Width
	Width	Depth										
	R'	S'	T	U	V	M	N	O	P	Y	Z	N'
200	1.000	1/2	4 3/4	1 13/16	1	4 1/2	0.656	1 9/16	15/16	2	1 11/16	0.656
250	1.000	1/2	5 1/2	2 1/4	1	5 3/16	0.781	1 15/16	1 1/4	2 1/4	1 11/16	0.781
300	2.000	1/2	6 1/4	2 3/4	1	5 15/16	1.031	2 3/16	1 1/2	2 5/8	1 11/16	1.031
350	2.000	1/2	6 13/16	3 3/16	1 1/4	6 3/4	1.031	2 3/16	1 1/2	3	2 1/8	1.031
400	2.000	1/2	7 11/16	3 5/8	1 1/4	7 1/2	1.031	2 3/16	1 1/2	3 1/4	2 3/8	1.031
450	3.000	3/4	8 3/8	4 3/16	1 1/2	8	1.031	2 3/4	1 3/4	3 5/8	2 9/16	1.031
500	3.000	3/4	9 1/8	4 5/8	1 1/2	8 3/4	1.031	2 3/4	1 3/4	4	2 3/4	1.031
600	3.000	3/4	10 9/16	5 1/2	1 3/4	10 1/8	1.281	3 1/4	2 1/16	4 5/8	3 1/4	1.281
800	4.000	1	13 1/2	7 3/8	2	12 7/8	1.781	4 1/4	2 3/4	5 3/4	4 1/4	1.781
1000	4.000	1	16 5/16	9 3/16	2 1/2	15 3/4	2.031	5	3 5/16	7	5	2.031
1200	4.000	1	19	11	3	18 1/2	2.531	6	4	8 1/4	6	2.531

All dimensions given in inches. [1] See Table 6 for plug gage dimensions.

[2] Corners at entrance side of keyways shall be chamfered at 45 deg, as follows: Nos. 200 to 350, inclusive, 1/16 in. deep; Nos. 400 to 600, inclusive, 3/32 in. deep; Nos. 800 to 1200, inclusive, 1/8 in. deep.

Productive Capacity does not impair Quality of

WEBBER GAGE BLOCKS

● This photo will give you some idea of the volume of Gage Blocks running through the Webber plant day after day.

Here you see precision gage blocks produced in quantity in the plant of the largest exclusive manufacturer of gage blocks.

Webber Gage Blocks are made under the most favorable conditions in an air conditioned plant—on the most modern equipment available—and tested in a temperature controlled room on instruments that reveal microscopic inaccuracies.

Because of this care of manufacture—under ideal conditions—by skilled craftsmen—Webber Gage Blocks have gained national recognition for accurate measurements in millionths of an inch.

They are now being used in hundreds of plants—in their laboratories—tool rooms—in various vital points of manufacture—to maintain dependable, close tolerances in the finished products of these plants.

Webber Gage Blocks are furnished in "A" accuracy sets tested to .000004 inch and "B" accuracy sets tested to .000008 inch.

Prices as follows:

Set No. 84A—$350.00 **Set No. 84B—$235.00**
Set No. 43A—$185.00 **Set No. 43B—$150.00**
Set No. 38A—(Thin Blocks) $195.00
Set. No. 38B—(Thin Blocks) $155.00

Webber service includes complete facilities for inspecting, reconditioning, and replacing worn or damaged blocks at a moderate cost.

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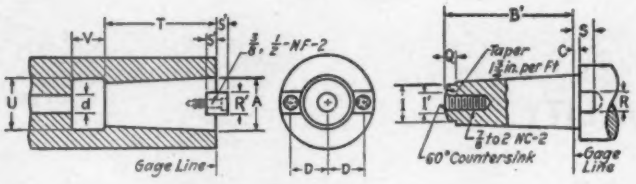
Machine Tapers—IV



Tolerances

For Diameter of Hole at Gage Line (A)
All sizes, +0.000 − 0.002

For Diameter of Shank at Gage Line (A)
All sizes, + 0.002 − 0.000

For Width of Drive Keyway (R')
In socket, +0.000 − 0.001

For Width of Drive Keyway (R)
In shank, +0.010 − 0.000

For Concentricity of Drive Keyway (R)
With center line of spindle, 0.003

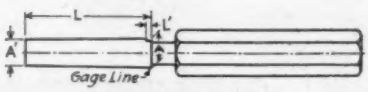
For Concentricity of Drive Keyway (R')
With center line of spindle, 0.001

Tolerances of Fractional Dimensions,
±0.010 unless otherwise specified

Table 5 Key Drive With Shank Retained by Draw Bolt

No. of Taper	Diameter at Gage Line	Shank									Drive Key		Socket					
		Length From Gage Line	Exposed Length	Screw Thread Holdback Rod		Drive Keyway		Diameter of Flat	Depth of 60 Deg Center	Length of Relief	Diameter of Relief	Center Line to Center of Screw	Fine Thread Series Screw (NF)	Gage Line to Front of Relief	Diameter Relief	Depth Relief	Diameter Draw Bolt Hole	Drive Keyway	
				Diameter (NC-)	Depth of Thread	Width	Depth											Width	Depth
	A	B'	C			I'	S	I'		Q	I	D		T	U	V	d	R'	S'
200	2.000	5 1/8		7/8	1 3/4	1.005	9/16	1 1/8	1/2	1/8	1 5/8	1 13/32	3/8	4 3/8	1 13/16	1	1	1.000	1/2
250	2.500	5 7/8		7/8	1 3/4	1.005	9/16	1 1/8	1/2	1/8	2 1/16	1 21/32	3/8	5 1/8	2 1/4	1	1	1.000	1/2
300	3.000	6 5/8	Min	1	2	2.005	9/16	1 7/8	1/2	1/8	2 1/2	2 1/4	3/8	6 1/8	2 3/4	1	1 1/8	2.000	1/2
350	3.500	7 7/16	0.003	1	2	2.005	9/16	2	1/2	1/8	2 15/16	2 1/2	3/8	6 13/16	3 3/16	1 1/4	1 1/8	2.000	1/2
400	4.000	8 3/16	Max	1 1/4	2 1/2	2.005	9/16	2 3/8	1/2	1/16	3 5/16	2 3/4	3/8	7 11/16	3 5/8	1 1/4	1 1/8	2.000	1/2
450	4.500	9	0.067	1 1/4	2 1/2	3.005	13/16	2 7/8	1/2	1/4	3 13/16	3	1/2	8 3/8	4 3/16	1 1/2	1 3/8	3.000	3/4
500	5.000	9 3/4	for	1 1/4	2 1/2	3.005	13/16	2 1/2	3/8	3/8	4 1/2	3 1/2	1/2	9 1/8	4 5/8	1 1/2	1 3/8	3.000	3/4
600	6.000	11 9/16	All	1 1/2	3	3.005	13/16	2 5/8	3/8	7/16	5 5/16	3 3/4	1/2	10 9/16	5 1/2	1 3/4	1 5/8	3.000	3/4
800	8.000	14 3/8	Sizes	1 1/2	3	4.010	1 1/16	3 1/2	1/2	1/2	7	4 3/4	1/2	13 1/2	7 3/8	2	1 5/8	4.000	1
1000	10.000	17 7/16		2	4	4.010	1 1/16	4 1/2	1/2	5/8	8 3/4	...	..	16 5/16	9 3/16	2 1/2	2 1/4	4.000	1
1200	12.000	20 1/2		2	4	4.010	1 1/16	5 3/4	1/2	3/4	10 1/2	...	..	19	11	3	2 1/4	4.000	1

All dimensions given in inches. See Table 6 for plug gage dimensions.



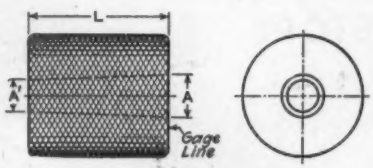


Table 6 Plug Gages

No. of Taper	Taper[3] per Foot	Diameter[1,2] at Gage Line A	Diameter[1,2] at Small End A'	Length Gage Line to Small End L	Depth of Gaging Notch L'
.239	0.50200	0.23922	0.20000	15/16	0.048
.299	0.50200	0.29968	0.25000	1 3/16	0.048
.375	0.50200	0.37525	0.31250	1 1/2	0.048
1	0.59858	0.47500	0.36900	2 1/8	0.040
2	0.59941	0.70000	0.57200	2 9/16	0.040
3	0.60235	0.93800	0.77800	3 3/16	0.040
4	0.62326	1.23100	1.02000	4 1/16	0.038
4 1/2	0.62400	1.50000	1.26600	4 1/2	0.038
5	0.63151	1.74800	1.47500	5 3/16	0.038
6[4]	0.62565	2.49400	2.11600	7 1/4	0.038
7[4]	0.62400	3.27000	2.75000	10	0.038
200	0.750	2.000	1.703	4 3/4	0.032
250	0.750	2.500	2.156	5 1/2	0.032
300	0.750	3.000	2.609	6 1/4	0.032
350	0.750	3.500	3.063	7	0.032
400	0.750	4.000	3.516	7 3/4	0.032
450	0.750	4.500	3.969	8 1/2	0.032
500	0.750	5.000	4.422	9 1/4	0.032
600	0.750	6.000	5.328	10 3/4	0.032
800	0.750	8.000	7.141	13 3/4	0.032
1000	0.750	10.000	8.953	16 3/4	0.032
1200	0.750	12.000	10.766	19 3/4	0.032

All dimensions given in inches.

[1] Gage Tolerance for Diameters (A) and (A')
Sizes .239 to No. 3, inclusive, +0.0001 − 0.0000.
Sizes No. 4 to No. 300, inclusive, +0.00015 − 0.0000.
Sizes No. 350 to No. 1200, inclusive, +0.0002 − 0.0000.

[3] Taper per Foot and Diameter at "Gage Line" (Col. A)
Basic dimensions.

[2] Dimensions in Column (A')
Calculated for reference only.

[4] These sizes are continued in the Tang Drive series for the present to meet special needs.

Table 7 Ring Gage

No. of Taper	Taper per Foot[3]	Diameter at Gage Line[1,2] A	Diameter at Small End[1,2] A'	Length L
.239	0.50200	0.23922	0.20000	15/16
.299	0.50200	0.29968	0.25000	1 3/16
.375	0.50200	0.37525	0.31250	1 1/2
1	0.59858	0.47500	0.36900	2 1/8
2	0.59941	0.70000	0.57200	2 9/16
3	0.60235	0.93800	0.77800	3 3/16
4	0.62326	1.23100	1.02000	4 1/16
4 1/2	0.62400	1.50000	1.26600	4 1/2
5	0.63151	1.74800	1.47500	5 3/16
6[4]	0.62565	2.49400	2.11600	7 1/4
7[4]	0.62400	3.27000	2.75000	10
200	0.750	2.0000	1.703	4 3/4
250	0.750	2.5000	2.156	5 1/2
300	0.750	3.0000	2.609	6 1/4
350	0.750	3.5000	3.063	7
400	0.750	4.0000	3.516	7 3/4
450	0.750	4.500	3.969	8 1/2
500	0.750	5.0000	4.422	9 1/4
600	0.750	6.0000	5.328	10 3/4
800	0.750	8.0000	7.141	13 3/4
1000	0.750	10.0000	8.953	16 3/4
1200	0.750	12.0000	10.766	19 3/4

All dimensions given in inches.

[1] Gage Tolerance for Diameters (A) and (A')
Sizes to No. 3 inclusive, −0.0001 + 0.0000.
Sizes No. 4 to No. 300 inclusive, − 0.00015 + 0.0000.
Sizes No. 350 to 1200 inclusive, −0.0002 + 0.0000.

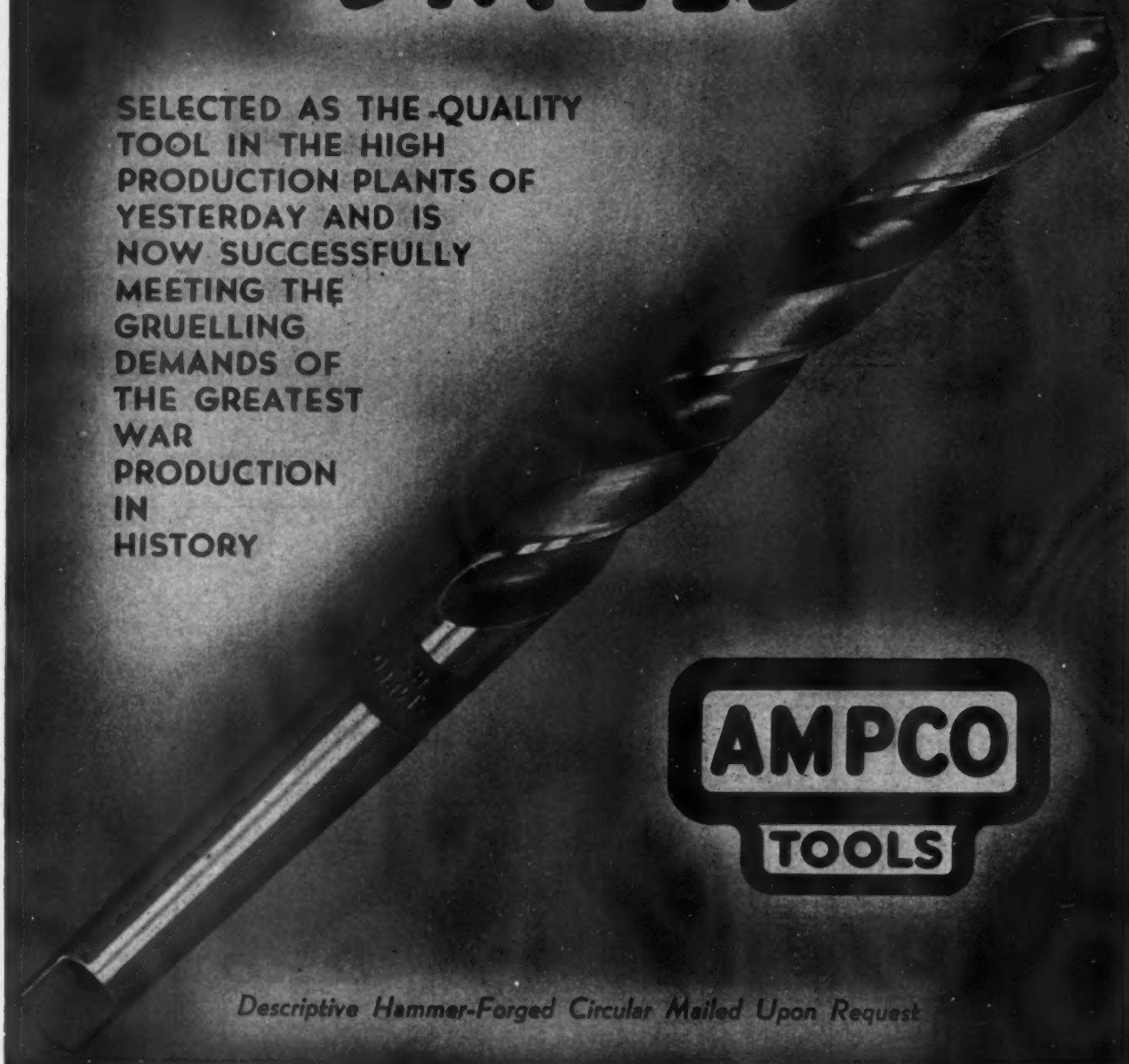
[3] Taper per Foot and Diameter at "Gage Line" (Col. A)
Basic dimensions.

[2] Dimensions in Column (A')
Calculated for reference only.

[4] These sizes are continued in the Tang Drive series for the present to meet special needs.

HAMMER FORGED DRILLS

SELECTED AS THE QUALITY TOOL IN THE HIGH PRODUCTION PLANTS OF YESTERDAY AND IS NOW SUCCESSFULLY MEETING THE GRUELLING DEMANDS OF THE GREATEST WAR PRODUCTION IN HISTORY



AMPCO TOOLS

Descriptive Hammer-Forged Circular Mailed Upon Request

AMPCO TWIST DRILL CO.

JACKSON, MICHIGAN U. S. A.

CHICAGO . DETROIT . CLEVELAND . PHILADELPHIA

Distributors in All Principal Cities

Not Yet in the Bag

SOVIET TROOPS are overwhelming masses of Nazis on the eastern front.

British and American air forces are loosing a blitz from the skies that is turning German cities and industries into a shambles.

MacArthur and Halsey are driving ahead to make fresh gains in the south Pacific.

The President has outlined a program to readjust returning soldiers to civilian life.

The manufacture of some peacetime goods is being authorized. Cutbacks and cancellations of certain war contracts are heavy, indicating that production is over the hump.

All of which adds up to something very desirable, provided that we guard ourselves carefully against one peril—the feeling that the war is "in the bag."

What comes of that feeling? An inevitable and perhaps unconscious letdown in production performance here at home.

Victory seems so close that the importance fades of straining to get out that extra weapon, that extra plane, that extra invasion boat.

What more could Hitler and Tojo ask of us than to feel just that way? It aids them in their plans to secure a negotiated peace, knowing full well that they no longer can hope to win.

There is no better method of visualizing the fact that victory is *not* just around the corner than to look at the world's war map.

Despite recent gains, all but a small Italian sector and a small Polish sector of fortress Europe is still in German hands.

Japan in the Far East remains in possession of a far-flung Empire that extends thousands of miles east and west and north and south.

Nothing has occurred yet in this war to foreshadow anything other than a bitter-end fight before our enemies are deprived of their spoils.

The only logical conclusion is that we will merely lull ourselves to sleep by thinking that the remainder of this war is a "coasting period."

No sane, sensible person can doubt that complete victory lies ahead if we continue to maintain that "drive" in war production that in an incredibly short time has put us at the top of the world in the output of war goods.

The way to achieve victory with the least loss of lives is to overwhelm our enemies with the sheer preponderance of our war equipment.

We haven't yet produced enough to arrive at that point. We have a long way to go before we get there.

Back in 1940 we thought we could superimpose our national defense production program upon our normal peacetime economy. We thought we could have both butter and guns. We found out that we were wrong.

We will be just as wrong now if we blandly accept the premise that victory is "in the bag" and allow that comfortable feeling of relaxation to take possession of us.

Burnham Finney

Gaging Business

Raw materials stockpiles accumulate and surpluses of manpower occur, but armed services won't give the "go-ahead" signal until the invasion is sufficiently progressed to indicate future needs. 1944 machine tool production expectation revised upward. December shipments drop

Hold Facilities in Reserve

Though raw materials and manpower may ease in the weeks immediately ahead, the chances are slight that Washington will approve of any major moves toward resumption of civilian goods manufacture until after the needs arising from the European invasion are established. Government agencies are united in carrying out a policy of playing safe. They don't want to release from war work any facilities that suddenly may be urgently required for an unforeseen war production program arising from the invasion itself.

No important shift is expected, however, in war output as a result of the invasion, though certain current programs may be accelerated. No new huge programs comparable with the invasion boat and motor truck programs are now in the making. The small truck program, in fact, has been cut back further. However, the schedule still calls for 100,000 big trucks. Both invasion boat and truck manufacturers are finding it extremely difficult to get precision bearings. Output of landing craft will suffer in February because of the steel tonnage lost during the walkout in December.

Steel Stays Tight

While war production should remain close to current levels indefinitely, the rate of cancellations is expected to increase considerably. The supply of raw materials has expanded so rapidly that the amount available is no longer an index to war production, as it once was. Steel operations are off a bit, and it is less hard to get steel now than even a month ago. Wide sheets and plate are very tight and will continue so until midyear, when an improvement is looked for as ship construction demands begin to taper. Though tonnages will be available in various forms of steel in the weeks ahead, WPB has no intention at present of permitting any of it to be used for consumer goods except the relatively small programs already decided upon. Again, releases to civilian users are being held in abeyance until invasion requirements are revealed after the invasion starts.

Metal-working plants are generally having less trouble securing manpower, but the situation is bad in many spots. Ball bearing factories in the East, for instance, are very short of men. Changes in war requirements, on the other hand, have released large numbers of men.

Hold Tools for Emergency

Reflecting the attitude of the government, WPB probably will not give the "go-ahead" for machine tool builders to make new machines for automobile companies and for other non-war customers until the military needs springing from the invasion of the Continent are learned.

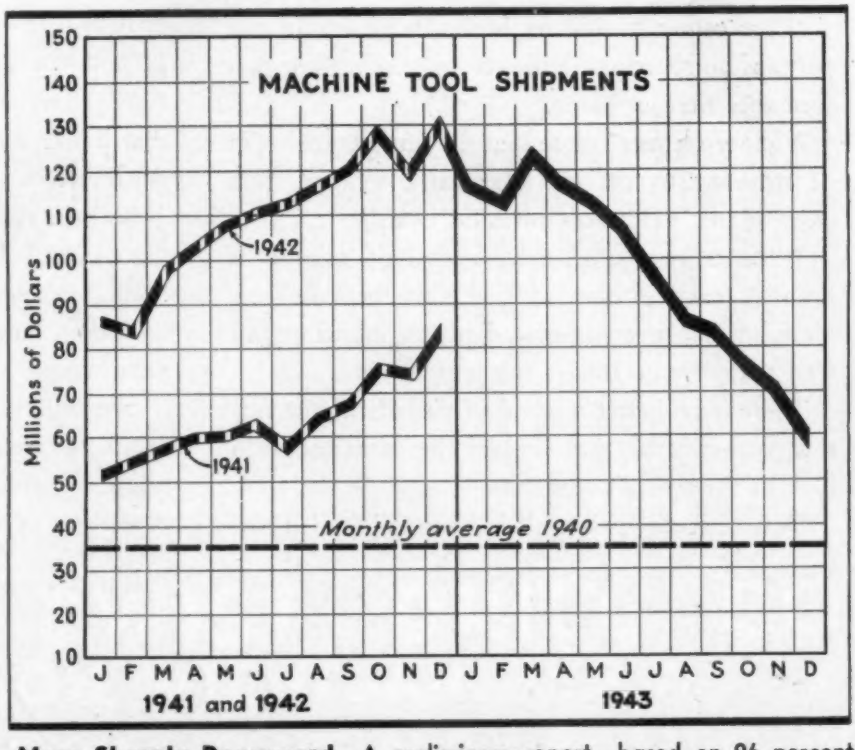
See Tool Production Up

Machine tool production sights for this year have been raised to $375,000,000, or $50,000,000 more than was earlier estimated. Close to one-fourth of this total may be shipped to Russia to aid her in her war effort. Comparatively little will find its way to England, which at one time in the war took a sizable percentage of the machines sent abroad. Indications are that shipments to other countries will be exceedingly small compared with exports to Russia.

The machine tool industry this year will do over $200,000,000 of subcontract work on direct war products. This is over and above the $375,000,000 of machine tool business. It is the equivalent of $400,000,000 of machine tool building, because in subcontracting the materials are supplied by the prime contractor. December shipments of machine tools showed the sharpest decline since the industry's curve started to slip. They amounted to $60,680,000, as against $71,811,000 in November. Total machine tool shipments in 1943 were $1,180,000,000, or 86 percent of the $1,360,000,000 produced during the peak year of 1942.

Net Tool Orders Drop

New machine tool orders in December were $27,000,000, after allowing for cancellations of nearly $7,000,000. Unfilled orders have shrunk to $211,751,000. That is over three months' production, measured by current operating rates. Some builders report a pick-up in orders from miscellaneous war sources this month.



More Sharply Downward—A preliminary report—based on 96 percent coverage of builders—indicates December machine tool shipments of $60,680,000, which is a 15.5 percent drop from November's final $71,811,000

Wilson Advocates That Industry be Partner in Preparedness

WPB vice-chairman tells Army Ordnance Association that the war-production front must have a continuing general staff operation to avoid a Pearl Harbor in the future

NEW YORK—A broad program of postwar preparedness based upon close and continuous association of industry with the armed services, was outlined before the annual dinner of the Army Ordnance Association by Charles E. Wilson, vice chairman, War Production Board. Characterizing disarmament as a "thoroughly discredited doctrine," Mr. Wilson advocated that the policy of a fleet in being should be extended to industrial capacity and research capacity for war. Through ability to manufacture proved and superior weapons, it will not be necessary to maintain large armed forces or depend upon universal military service.

Mr. Wilson's ideas were: (1) that the preparedness program must be made the responsibility of the Federal government, that it be a continuing program and that it be "insured and supported" by Congress; (2) the services should maintain active well-financed research activities, arsenals and proving grounds; (3) selected war-plant facilities should be kept in adequate standby condition; and, (4) industry be given contracts for corollary research work and production of educational orders at least. And in playing its part in the preparedness program, Mr. Wilson said industry must be allowed to do so without political witch hunts or being tagged with the "merchants of death" label.

According to the program, each industrial firm of prime-contracting status would maintain an executive familiar with the needs of conversion to quick output of needed war material, subcontracting facilities and the preparedness research activities being carried out by his firm. Responsible civilian advisors should be named to committees working in liaison between industry and government laboratories and proving grounds. Chairmen of such committees, along with ranking Army and Navy officers, would compose a general committee for directing postwar research. And out of this group there might be selected an industrial coordinating committee to work with the principal procurement officers along the idea of combined chiefs of staff.

Before Mr. Wilson outlined his plan, the Crozier Gold Medal was bestowed by the Army Ordnance Association upon Maj. Gen. L. H. Campbell, Jr. Admiral Hussey of Bureau of Ordnance, Navy Department, accepted the Scott Gold Medal on behalf of former Admiral W. H. P. Blandy, former Bureau chief and now at sea.

CUT BRITISH TOOL MAKING

WASHINGTON—The shift of emphasis in the United Kingdom to the production of critical components will see a 47 percent reduction of machine tools during 1944, as compared to that of the peak year. At the same time, manpower employed making machine tools will drop 58 percent.

The cutback is expected to result in some requirements of machine tools of standard type from the United States. To insure the availability of needed tools, requirements will be transmitted through British Machine Tool Control and the British Supply Mission to the Foreign Economic Administration, here, which will consult proper U. S. agencies and advise of its findings. Insofar as the needed tools are available, the proposed curtailment of British production will be implemented.

FEA on November 15 removed export of machine tools to Britain from the lend-lease category and placed it on a cash basis. Prior to that 75 percent of the machine tools exported to Britain were paid for; the 25 percent balance went via lend lease.

Congress and Administration Contend Renegotiation Changes

WASHINGTON—When the Senate sent its version of the belated 1943 tax bill to conference with the House it embodied a provision that would exempt machine tool and construction machinery builders from renegotiation of profits resulting from work done in any firm's fiscal year ending after June 30, 1943.

As it entered conference, the Senate bill provided that renegotiation shall not apply to any producer after December 31, but gave the President authority to extend the termination date by six months. This means that the Senate intends to stop renegotiation by June 30, 1945—by which time war production should be sharply curtailed—and implies that there will be no more revision before then.

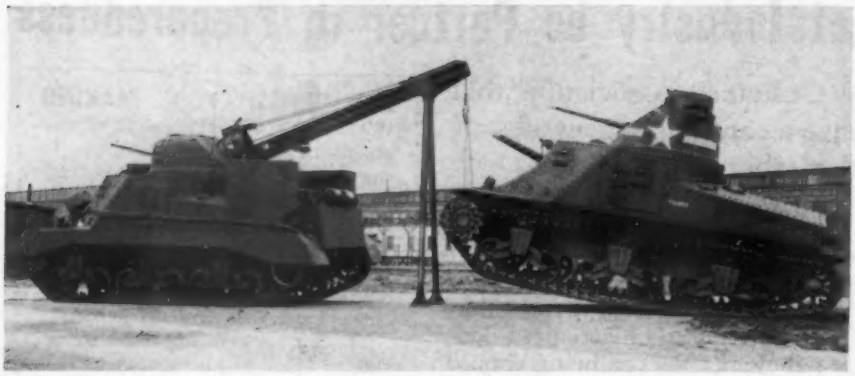
Court Review Probable

The final bill will contain a provision for court review of renegotiation settlements—just how extensive, will depend on the conference agreement.

A provision which the Administration did not like is that which would direct that problems in connection with reconversion be taken into account during renegotiation; another would direct that renegotiators decide whether profits remaining from war contracts will be excessive after the payment of estimated federal income and excess profits taxes.

Maj. Gen. L. H. Campbell, Jr., chief of Ordnance, USA, right, receives from Brig. Gen. Benedict Crowell (retired) the Crozier Gold Medal, awarded by the Army Ordnance Association, for his leadership and ability in the conduct of vast responsibilities in the present war. Presentation was made at the Association's 25th anniversary meeting

International



Tank Retriever—To demonstrate its operation while repairing or towing disabled land battlewagons, the tank retriever designed and built by The Baldwin Locomotive Works lifts an M-3. The engine-powered boom enables removal of turret, guns or engine on the spot. The boom jacks telescope into the rear of the retriever. Winch inside machine has a 30-ton capacity. Manned by a crew of four, it carries full equipment, spare parts and tools.

WITHHOLD ALLOY PRODUCER

WASHINGTON—In line with the cutbacks in the alloy steel production program, War Production Board may stop construction of the $86,000,000 Republic Steel Corp. alloy steel plant, South Chicago, Ill.

The plant is complete except for two 32 and 36 in. rolling mills. Whether or not it will be completed depends upon future alloy steel needs. That output is now more than sufficient is indicated by a WPB order relaxing restrictions on alloy production.

Alloy steel production in 1943 totaled 13,116,000 net tons, nearly 14 percent above 1942's 11,526,000 tons and more than four times output in 1939.

West Coast Migratory Labor Sure of War End, Leave Area

SAN FRANCISCO—Further adding to its two years of manpower troubles, the West Coast is being plagued by an emigration of migratory workers. War Manpower Commission officials say the workers have absorbed the national conviction that the war is about over and have decided to move elsewhere in search of peacetime jobs, or else are returning to the homes they left in search of war jobs.

In a two-month period the net loss of migratory workers in a ten-county area including and adjacent to San Francisco Bay was 2,703.

The two-months old West Coast plan has reduced overall labor turnover 35 percent, said Sam Kagel, Northern California area director, WMC. "Nevertheless, the imposition of manpower ceilings and accompanying regulations have failed to create on this part of the West Coast a 'labor pool' which officials had hoped would result."

Training Plane Engines Are To Be Produced in Brazil

NEW YORK—Wright Whirlwind and Fairchild Ranger engines will soon be produced at the rate of more than 500 a month in the first airplane engine plant in Brazil, Brig. Gen. Antonio Guedes Muniz of the Brazilian Air Force has announced. Production in the government-owned, 80 percent-U. S.-equipped plant will start in April and provide the engines needed for maintenance of Brazilian Air Force training planes.

General Muniz pointed out that this production will stop the drain on U. S. production of 450 h.p. training plane engines, speed the day Brazilian Air Force pilots can join the Allies in overseas action.

WMC Reports Training

WASHINGTON — During 1943 3,300 additional plants have adopted apprenticeship and/or short-term training systems, with the assistance of field representatives of Apprentice-Training Service, that division of the War Manpower Commission reports. These are in addition to the 28,000 other plants and establishments which had similar programs in operation prior to November, 1942.

There are two different kinds of apprenticeship systems in operation—area-wide systems and individual plant systems. The former type covers an average of 30 employers in a city. Short-term programs are, with almost no exception, established on an individual plant basis.

WPB Considers Experimental Production of Civilian Goods

WASHINGTON—Under consideration for relaxation of the metals restrictions are three War Production Board areas with headquarters in Philadelphia, Cleveland and Kansas City. This action is part of well advanced plans, designed to allow manufacture of civilian goods in small shops and factories. It is the result of mounting concern over accumulating surpluses of iron, steel, copper and aluminum.

Would Use Leftovers

Such action would use metals remaining from arms production, or piled up as a result of munitions cutbacks, while contributing to the supply of consumer goods and providing a test to guide WPB when military developments warrant a greater expansion of the civilian field.

Aluminum pots and pans, steel household goods and cooking utensils, metal venetian blinds, steel knives and forks, and similar items are on the list for which production approval is expected. WPB has emphasized that it has no intention of allocating material for less-essential civilian goods at this time, and probably not until the invasion picture is in sharp focus.

Partly Fabricated Material

Plants embarking upon production of approved items would have to obtain left-over materials, most of it in partly fabricated form. It was recently estimated by WPB's steel division that 2,000,000 tons of such steel is now idle, with the probability that production cutbacks would increase the pile.

Production approval would be limited to plants in areas in which manpower is not acute.

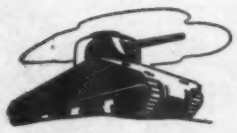
This and That . . .

WPB is studying the feasibility of conducting a new survey to determine degree to which machine tool industry is manufacturing components.

Present Latin-American demand for used machinery is estimated as between $20,000,000 and $35,000,000. Quantity lying idle, pending clearance by claimant agencies, is estimated at "ten times that amount."

British machine tool producers are booking Latin-American orders for delivery "if, as and when."

Plans to tool up motors with a great number of cylinders—as high as 42—are reported. Bore would be smaller, output higher, than that of any combat motor now in service. If these plans mature, it is probable that a considerable investment in new machine tools is in the offing.



Inside Detroit

Formation of a Michigan firm stirs more rumors of Kaiser's postwar intentions. Big postwar demand for larger machine tools seen. Landing craft program to predominate for a year. General Motors incentive pay plan shows results at Harrison plant

BY SILER FREEMAN

He's in Again Henry Kaiser keeps floating in and out of the automotive picture like a firefly on a June night. First you see him and then you don't.

The latest move of the West Coast production genius has been to organize a Michigan company, capitalized at $50,000, but with only $1,000 of paid-in capital. It consists of 500 shares of common with a par of $100 each. The company is known as the Michigan Kaiser Co. Directors are Henry L. Kaiser, G. G. Sherwood, Paul S. Marrin, Robert L. Bridges and E. E. Tresthen, Jr.

Articles of incorporation were filed at Lansing on January 4 through a dummy corporation which later transferred the stock to the present directors. As rumored before, plant facilities are being sought in the Detroit area. It may mean something and again, Kaiser has stirred talk before.

Tool Sales to Predominate More machines and tools will be bought from the government after the war by automotive manufacturers than floor space, a high official in one of the large corporations predicts. He bases the predictions on the fact that Defense Plant Corporation buildings went up at a cost of about $10 a square foot of floor space against a $3 prewar cost. This makes the costs prohibitive to manufacturers, even if the depreciation should be set at a more than nominal figure.

Tool Costs Rose Little Machine tool costs, however, have been kept at nearly the same level since the war as before the war, he pointed out. This is true especially on the big machines. A large milling machine, he said, costs about as much to build before the war as it does now.

The same executive predicted a big demand for the larger stuff. The promises of the machine tool industry of better stuff after the war may come true, he pointed out, but the big machines can hardly be improved very much. He did admit that high production machinery could conceivably be improved and probably would.

Slight Demand For Air Plants Automotive companies affect little interest in purchasing aircraft plants which will have to be abandoned after the war. It is estimated that the aircraft industry must shrink back to about ten percent of its present capacity after the war.

The aircraft engine plants, however, may find some market with auto manufacturers looking for expansion facilities. One auto official saw the DPC aircraft engine plants as being suitable for almost any medium weight industry, including automobile making. Again the cost factor was expected to be the deterrent.

Diesel Plants Rush Output The landing craft program still holds the No. 1 position in this area and has put a heavy strain especially on the Detroit Diesel Engine Division of General Motors. Everything else is being sidetracked to give power plants to the landing craft.

The strain is being felt by the diesel makers primarily on spare parts. It is evident that the craft will be used in the stepped up offensive in the Pacific and that no landing ships will be made available from the European theater for a long time to come. The program is scheduled to run through the entire year without much letup.

They Want To Go Back Auto manufacturers, who have been doing more than their bit of aircraft work, are itching to get back into their old lines to make use of the design and manufacturing technique which they have picked up in the new field.

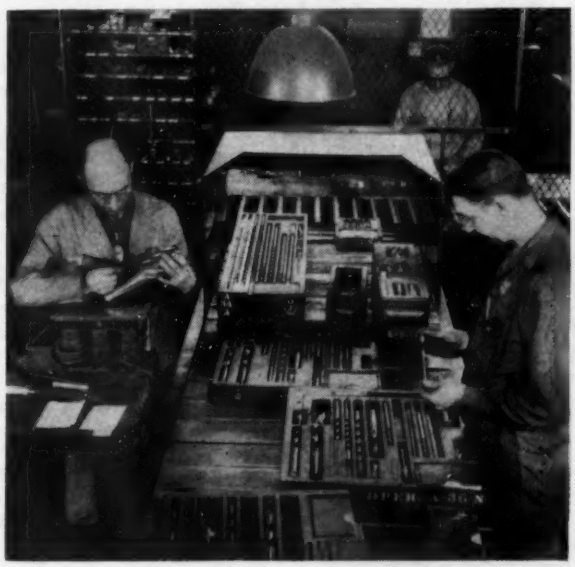
They have found, according to one high official who has been closely connected with airplane engine development, that it doesn't cost too much to finish a part or to stress steels under proper controls. He predicted wider application of aircraft techniques if the demand comes for higher compression ratios in engines to utilize high octane gasolines.

Tries to Sell Incentive Pay General Motors and the UAW have ended their annual waltz. Hearings before a three-man War Labor Board panel on contract renewal have been concluded, and in about a month, the panel will report its findings to the National board. The panel was instructed merely to sit as a fact-finding body.

Out of the 34 issues before the panel, only several brought great controversy. One was the corporation's demand that the union retreat from its position against incentive pay. GM presented figures on incentive pay contracts negotiated with the CIO in two of its plants, to prove that piece work means increased production.

It cited the Harrison Radiator plant at Lockport, N. Y., where three departments used the incentive system. In one, production increased 37 percent, the second 50 percent and the third 90 percent. In the Arrow Products division in Dayton, Harry W. Anderson, vice president of GM in charge of personnel, showed that one department had boosted production 30 percent, another 57 percent, a third 31 percent, a fourth 49 percent and a fifth 29 percent.

The union, while not contesting the

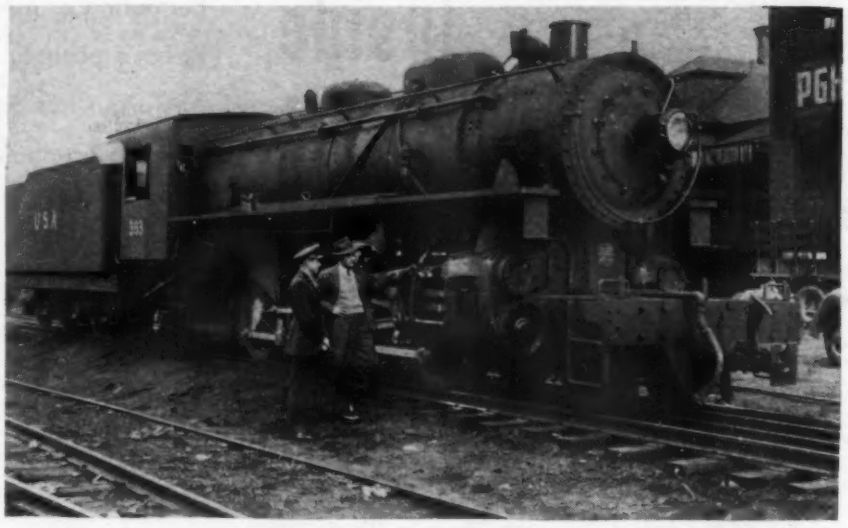


Tool Handling Speeded—A tool control system at the Grand Rapids Stamping Division of Fisher Body, maintains high production sharpening of precision cutting tools, conserves tools and cuts lost man and machine hours on production lines. Shown is a mechanical conveyor that carries filled tool sets from the grinding area to the disbursement crib

corporation's claims to increased productivity under the incentive system pointed to statements of Donald M. Nelson and C. E. Wilson, president of GM, to the effect that production records had been set all over the country on an hourly basis. Walter P. Reuther representing labor, stated that three GM plants having incentive systems had asked the WLB to do away with it. The union charged that workers in the Chevrolet plants working on piece basis are making less now than they did two years ago, a statement to which the company took exception.

GM, arguing against the union's principal demands for cost of living bonus, $1 per hour minimum, 10 percent night shift bonus, 12-day sick leave and a post war reserve would cost the corporation between $407,000-000 and $528,000,000.

The panel which heard the arguments consisted of James E. Carey, representing labor; Walter White, representing industry, and Ralph Ziegler, public member. It will meet in February in Washington.



Invasion Power—Eight days from laying the frame the H. K. Porter Co. completes and has boxed for shipment "General MacArthur" locomotives for overseas use by the Army. This type is one of the largest narrow gage locomotives made and one of the most powerful used by the Army

Estimates of Chicago Manpower Disagree; Oppose Worker Draft

CHICAGO—The manpower situation, here, despite the recently ordered 48-hour week, remains in a muddle, according to metal trades sources. Opinions of government spokesmen and industrial leaders—regarding the manpower supply—range from feast to famine predictions.

Reports that the Chicago area will be reclassified as a No. 1 shortage area are denied by William H. Spencer, WMC director here. He said, however, the matter is under study and may be decided by February 1. He describes the situation as becoming increasingly serious as West Side plants have come into operation and additional contracts have been awarded, while the supply of workers has not expanded.

One large plant, not yet in production, needs 30,000 to 40,000 workers.

Urge Better Utilization

With the 48-hour week in effect, the principal change if the No. 1 classification were imposed would be the banning of the award of war contracts in the area if similar productive facilities were available elsewhere. Seeking to avoid such classification, the Chicago Association of Commerce has recommended an immediate review of manpower requirements by plants, a reduction in hiring demands when possible, and the placing of only minimum orders with U. S. Employment Service.

Oppose Manpower Draft

Chicago industrial and business leaders have been sharply critical of the President's suggestion of a nationwide manpower draft. Wilfred Sykes, president of Inland Steel, declares his unqualified opposition. Others say there is actually no labor shortage; the problem is to regulate the labor we have, a thing inadequately done thus far, they say.

And Victor Fabian, district manager for the Smaller War Plants Corp. in Illinois, estimates that 272 industrial plants here employing from 12,000 to 15,000 workers lack sufficient contracts or sub-contracts to keep them going at maximum capacity. The 272 companies include 36 iron and steel plants, 38 plants producing nonferrous metals, 23 makers of electrical machinery, and 32 of non-electrical machinery.

Borrowed Time

The final word is that of a WMC spokesman who says that Chicago has been in Group 2 classification for 11 months, and for five of these "has been living on borrowed time."

WILLOW RUN ROLLS 'EM

DETROIT—For each of the past three months Ford production of Liberators has exceeded quotas, according to several well-informed sources. Already producing bombers with one-third less labor than the national average of aircraft plants, Ford is realizing above-quota output with fewer workers than 90 days ago. Reasons are: (1) reduced turnover and (2) increasing experience of the individual employee. In contrast to the situation several months ago, Ford is now able to get ample replacements in the Detroit labor market, and can select either people with production experience or those showing an aptitude for training. Rising production of plants like Ford has caused various suppliers of aircraft parts to return to a seven-day week.

Form Disposal Company

WASHINGTON—Canada is embarking upon a program, through its newly formed War Assets, Ltd., of warehousing all government surpluses originating from the war effort, with plans of postwar disposal in manners designed to do least harm to the markets. J. Ballantine Carswell has been appointed president of the new corporation, which will have its headquarters in Montreal and an important branch in Washington; just how important may be judged by the fact that Mr. Carswell—formerly director general of the Washington office, Canadian Department of Munitions and Supply—is not moving his family from the U. S. capital.

The disposal program is expected to continue, for some items, as long as twenty years. Some material and equipment will be set aside as stockpiles for purposes of national security; some will be used for postwar rehabilitation. Considerable exports of the simpler types of tools to China, and other areas which are being industrialized, is expected.

Existing commercial organizations will be used in making the sales.

Wartime Washington

Baruch-Hancock report has realistic approach to plant clearance and surplus machine sales. Claimant agencies can slow sales. War Department favors central agency disposal. Easing manpower picture makes national service law unlikely

Discuss Surplus And Termination

Plans are shaping up for a complete clarification shortly of the government's policy on the sale of surplus machines and plant equipment and on the clearing of equipment and materials from plants following termination of war contracts. The plans will be revealed in a Baruch-Hancock report and now are in the discussion stage among the government agencies involved—Army, Navy, Defense Plant Corp. and Maritime Commission. The Army is said to be leading in these discussions.

If the proposed program is adopted, war contractors will immediately be given a chance to designate the government-owned machines in their plants that they wish to retain after the war and will be allowed to purchase them. The only stipulation will be that these machines must be continued on war work as long as the contractor is producing war goods. The heart of the program is the price formula to be applied to surplus equipment. The exact formula has not been agreed upon, and information about it cannot be revealed, but this much is known: the approach to the problem is on a realistic basis. The prices will be on a level that will make it desirable for contractors to buy the equipment, yet the government will receive a fair return.

Services can Set Sales Speed

Obviously the armed services will take precedence over war contractors and will have the privilege of retaining whatever equipment they deem necessary for the country's future defense. No machinery will be released for purchase by private contractors until the particular government agency involved certifies that it does not want it and certifies it as "surplus." That stipulation has in it the possibility of being the bottleneck in the whole program.

Army Favors Central Sales

The War Department takes the position that its responsibility ceases when it designates a piece of equipment or a property as "surplus." From that point on, the method of disposal must be determined and carried out by other agencies. Whether a central disposal agency is created or some other means is found of selling surplus equipment is declared to be out of the bounds of the War Department's interest. The department informally believes, however, that a central agency is necessary. Two means of establishing a central agency are available: to use an existing agency such as the Treasury Department or the War Production Board, or to set up a new and independent agency by act of Congress or by executive order. The most likely action will be the creation of a new agency by legislation.

To clear plants of unwanted equipment, provision will be made for machinery to be moved to warehouses operated by the various agencies owning the equipment. The war contractor can store equipment and materials if he has the room, but will be able to collect storage charges on it and the risk must be assumed by the government agency. The largest group of machine tools owned by the government is on Army Air Corps work, but has been financed by DPC. The next largest group is owned by Army Ordnance. The Navy and Maritime Commission are much in the minority.

Oppose Starnes And Murray Bills

The House Bill for disposal of surplus machine tools, introduced by Representative Starnes of Alabama, follows closely the Senate Bill recently offered by Senator Murray of Montana. The main difference is that in the House Bill provision is made for larger manufacturers to purchase surplus machines after the small shops have had first opportunity, whereas in the Senate Bill the bigger contractors are excluded entirely. The War Department is vigorously opposed to both bills. One reason for this opposition is that the bills call for creation of a nine-man commission to supervise where surplus machines should be sold and what should be done with them. On the proposed commission the War Department has only one member and only one vote, though it has one of the biggest stakes of the agencies involved.

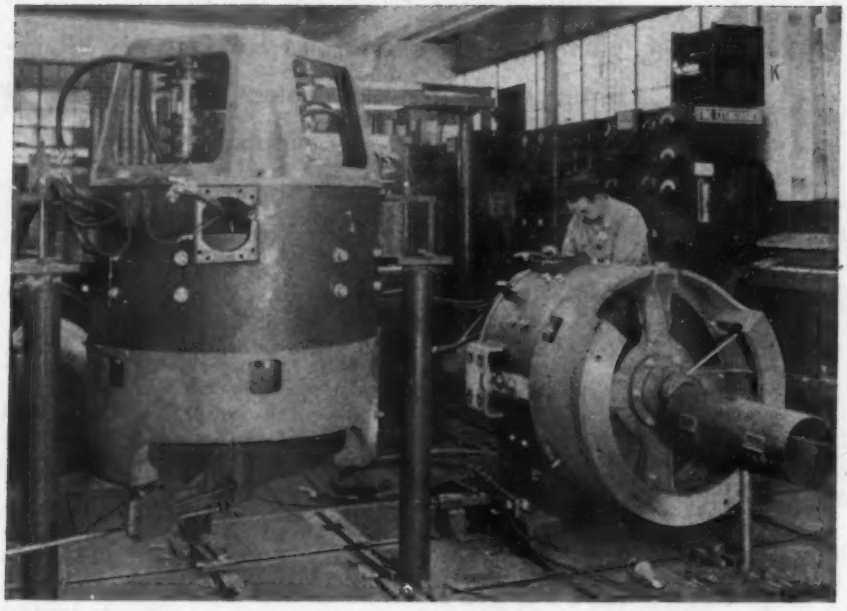
National Service Laws Unlikely

Possibilities of national service legislation are fading fast as manpower surpluses increase. Labor's opposition is even more pronounced than it was when such proposals were made early in the war. Labor fears it has no political friends, and that the administration of a national service act could not avoid being affected by politics. Management's risk from national service legislation seems to be fully recognized. Should such legislation ultimately be enacted, labor would certainly make demands that white-collar executives be told where they might work.

Whether there will be any anti-strike legislation is believed in Washton to depend on what happens in the next few weeks in the way of strikes.

Signal Corps

To Speed the Invasion—A battalion of soldier-experts at an Army assembly plant in Britain are assembling 30 railroad cars of all types each day. With component parts stacked to one side of the production line, assembly flows smoothly through the shop. Above, the two men at the right attach the bumpers to the main framework, while the others place the "pedestals"



Self Facing—When a large enough lathe was not available, Reliance Electric & Engineering Co. attached a special cutting arm to the drive shafts of heavy electric motors urgently needed for the Victory ship program, and used the power of the motor itself to face its horseshoe base brackets

Advocacy of National Service Seen as Smart Bid for Votes

WASHINGTON — President Roosevelt has put organized labor on the defensive by advocating a national service act. Such a measure, which would empower the federal government to draft for industry as many able-bodied men and women as needed, evokes the violent opposition of both the A.F.L. and C.I.O. The only labor support for national service comes from Communist-led unions which, in Russia's interest, are prepared to back any proposal which promises increased war output.

Congress is cool to national service, but high Administration officials like the Secretary of War will keep the issue alive. There is even some question about how serious the President himself is in advocating a labor draft, but as a piece of political strategy it will serve him well.

Favored by Middle Class

Although the proposal finds hostility in organized labor's councils, and organized business, through the U. S. Chamber of Commerce and the National Association of Manufacturers, is also on record against it, Gallup polls show a large and consistent majority favoring the national service principle. This unorganized middle-class group is the strata in the voting population for which the President's advocacy will be "smart politics."

But Washington calculates that an even smarter maneuver is intended and that the President had a weather eye on organized labor. Here's the way the tactic is figured: (1) By coming out for national service as a device for curbing strikes, Roosevelt can claim that he has diverted Congressional attention from more direct anti-strike, anti-union legislation. This will increase labor's debt to him. (2) He can also push the national service issue or let it die, now that he has thrown it into the arena of Capitol discussion. This gives him a rein on labor leaders. If they go along, he'll forget the issue; if they get out of line he'll put on the heat for such a measure's passage. (3) By backing and filling on the issue, or just by keeping quiet and letting his aides talk about it, the President rams a bigger problem than the Little Steel formula and wage control down labor's throat. The unions will make beating national service their prime concern and relegate their interest in breaking wage control to a secondary position.

A Two-Edged Sword

The President's inability to deliver on his promise of a price rollback, his clumsy handling of the railway labor dispute, and his determination to hold to the Little Steel wage formula have shaken what was his once solid support from the unions. He's in a position where he has to either bring labor back into line behind his Administration or trade off its support for a chunk of middle-class backing. The national service act proposal is the kind of two-edged sword which will let him swing in any direction.

BRAZIL MAKES MACHINERY

WASHINGTON—Brazil is manufacturing simple types of machinery, as part of its program to increase its self-sufficiency in this field.

To the end of last November, the State of Sao Paulo, Brazil, has produced 1,876 lathes, valued at $1,342,050, compared to 1,047 valued at $553,225, produced in a like period of 1942.

A cigarette establishment has partially converted to the manufacture of cigarette machinery. Three companies now produce laundry equipment.

Would be Prepared

WASHINGTON—Machine tool people are making every effort, quietly in unpublized meetings, to sort out and channel the thinking and plans on conversion to peacetime production. Emphasis is being laid on the fact that it is not a postwar problem, but one that arises each time industries are cut back and surpluses of machinery, materials and men develope. As we see more clearly the trend of the war, they point out, there will be further cutbacks and fewer war contracts in operation; to meet this we must increase civilian production if we are to alleviate a major postwar shock to our economy.

Urge Laying Plans

At present Washington considers that, until Hitler is licked, any conversion thinking is almost treasonal. But efforts are going on to get governmental bureaus thinking along right lines of preparation for conversion. The machine tool and auto industry people are seeking the development of a sympathetic understanding and the laying of plans, so that reconversion will be an evolutionary rather than a revolutionary process. They are not necessarily seeking retooling at once.

Industry Kills More

WASHINGTON — Accidents in war plants are "a major production and manpower problem," according to Office of War Information, which reports that deaths and injuries on the job cause the loss of 270,000,000 man-days a year, or the equivalent of the withdrawal of 900,000 workers for a year.

Industrial casualties between Pearl Harbor and Jan. 1, 1944 were 37,600 killed, or 7,500 more than the military losses, and 210,000 permanently disabled and 4,500,000 temporarily disabled, or 60 times the number of service men wounded and missing.

Injuries account for four times as many lost manhours as strikes, with 50,000 workers absent every day.

Spotting The Air News

Jet propulsion has been under development in England, Italy, Germany and the United States for years. The Italians had the first luck with it. Successful tests were made at Army's Wright field many months ago. Army broke a long-standing precedent in announcing the Bell P-63 jet-powered plane before the enemy got a specimen. This was done because, first, so many people knew all about it that continued secrecy was almost useless. Second, it was feared the Germans would announce theirs first. Many informed persons doubt if jet power gets into the Army's air war. Its main drawback is high fuel consumption and short range. Our need is for longer fighter range. Germany can use it to good advantage when ready.

Army made a mistake in releasing the jet power and Black Widow stories at the same time—the Widow called the P-61, got very little attention. This plane is a big heavy twin-engined night fighter by Northrop. It looks something like the Lockheed twin-engined, twin-boomed Lightning P-38, only much larger. It is a conventional airplane in most respects, but it has more of everything than usual. Its chief advantage, however, is its new aids to navigation and its fire control instruments—the nature of which should not be discussed yet awhile. The airplane practically thinks: it can almost hunt out the enemy in dark or overcast and train its guns on him. It probably will do much more damage to the enemy than the P-63.

Warplane production picture changes color almost overnight. Most people know by now that the 1944 schedule does not even call for the 10,000 per month we have been shooting at. The schedule is 113,000 and production expected is 110,000. But now there is a possibility that the unit output per month will drop off. If so, it will be the result of deep cutbacks in trainers and liaison (grasshopper) types, and still greater emphasis on heavy bombers, plus ever-increasing weight of fighter and other attack models.

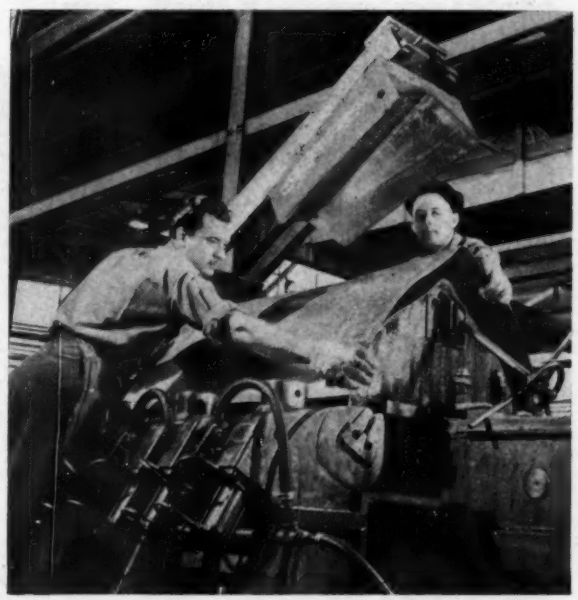
Army is deeply concerned about the effect a level or declining unit output curve would have on the public. People like to read about increasing thousands of planes. Months ago the President reported plane output in pounds, in an effort to establish a weight measurement of airpower. But he had no luck. Now the War Production Board is trying to prepare news readers for the inevitable shock. A release by Charles Wilson, head of WPB's aircraft section, says that if 1942 models had been continued, the industry would have produced 167,000 warplanes in 1944. He states that average weight of airframes, including spares, increased from 4440 pounds in 1941 to 6110 in 1942 to 8630 in 1943 to an estimated 10,000 in 1944. It is possible WPB will turn to poundage and stop announcing unit totals, but people won't like it.

We want to start now, getting used to air power by the pound. Total output in 1941 was 76.1 millions pounds. In 1942 it was 253.1. In 1943 it went like this, by months: 30.3, 35.5, 41.0, 45.6, 50.5, 53.6, 56.0, 59.5, 61.4, 66.7, 71.2, 73.6—and the total is 644.9. The airplane division's estimated total poundage in 1944 is 1,009.0 millions pounds. Total unit production in 1943 is given as 85,919 or 85,946. They are both right; some adders up include 27 target planes, and some do not. The 1942 figure is 47,873; for 1941, 19,290.

It is understood, in the government and in the industry that the airplane program in 1944 is tentative. The cool-headed outlook on the German war is that it can fold up any time—from now on. WPB already has experts trying to calculate the probable cutback in major war contracts when the Nazis quit. Naturally, they disagree. Some of the very top leaders, who have all the information there is, estimate the stop orders on ships, planes, etc., at about 25 percent of the total. Others put the figure as high as 50 percent, and more. Allied air power on that day will invoice like this: (1) all British and American stuff in action; (2) all of both countries' planes in pipelines from factory to front; and (3) all scheduled production. Tremendous is the only word for it, and it all goes against the Japs.

4000 horsepower diesel aircraft engines for aircraft are predicted by W. W. Davies, superintendent of research for United Air Lines, within five years. He expects that engine weight will go down from the present 1¼ pounds to one pound per horsepower, probably less. Within ten years Davies looks for a considerable increase in the use of diesels in civilian craft. In his opinion, airline speeds will rise from 160 to 250 mph within five years after the war, and airline operating cost per mile will drop from the present 40 cents to 15 or 20 cents within ten years. Most interested persons will recall that diesel engines were flown in airplanes years ago, but some important problems remained unsolved.

Notes for your book . . . Old B-17 Fortresses (the current model is G) are being converted to cargo carriers in the South Pacific where Japs attack supply planes; the B-17's carry their guns and crews, drop cargo through bombays — attached to 'chutes if breakable.



Contour Controller —Through the use of a giant clamp working in conjunction with a powerful air-operated ram at the Westinghouse Electric and Manufacturing Co. plant, Mansfield, Ohio, both positive and negative curves are attained in making the tail cone of a Republic P-47 Thunderbolt fighter plane

Deflate Postwar Car Dreams; Discuss Materials and Designs

DETROIT—Postwar automobiles probably will never approach the glamorous dreams of "world of tomorrow" writers. Mundane matters of cost, material supply and fabricating facility will have a lot more to do with the features of the postwar car and its use of steel, aluminum, plastics, glass than the concepts of stylists without authority in the automobile industry. That was the picture sketched in broad outline by speakers before the annual meeting of the Society of Automotive Engineers, Detroit, Jan. 10-14.

From the body man's standpoint, steel will probably win out for body and sheet-metal parts in the postwar battle of materials, according to E. C. DeSmet, executive engineer, Willys-Overland. Steel sheet will cost about 40 percent as much as secondary aluminum in all probability, is more easily fabricated, takes deeper draws, can be repaired more readily. Adoption of laminated plastic or plywood bodies is considered even more remote. Great curved windows and windshield of glass or translucent plastic are not satisfactory from the optical and service viewpoints.

Aluminum in Chassis

Substitution of aluminum for ferrous materials is most likely to come about in the chassis parts where weight concentration is greatest and fabrication methods might not be materially affected. But the automotive industry is unlikely to pay a premium for weight saving as such.

At prewar prices of seven to eight cents per lb. for secondary aluminum, only one car—a limited production make—used as much as 35 lb. per vehicle. In taking a look at the postwar secondary metal market, L. W. Kempf of the Aluminum Company of America hazarded this opinion: Secondary metal of new composition—three to four percent copper, one percent or less each of silicon, iron, and manganese—may be available at five cents per lb. (equivalent to cast iron at one and three-quarters cents). Supply will be adequate to aluminize power plants (160 lb. per vehicle) of 1,600,000 cars per year, and possibly enough to provide 500 lb. for 3,000,000 cars.

Extensive shifts to aluminum for chassis parts will not come before the third year after the war. For casting automotive parts in mass quantities, closer technical and shop control than with iron will be required to obtain uniformity. Alloy for postwar casting purposes will probably be four percent copper, three percent silicon. Forgings will be available in adequate supply.

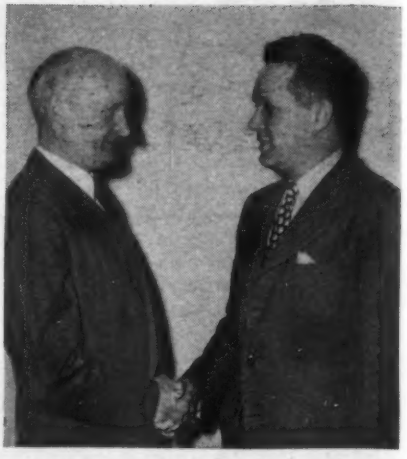
No Dream Cars

The layman's idea that aircraft-type engines may be adopted in early postwar autos was blasted by two speakers. Future compression ratios will not exceed 8:1, said E. J. Willis, also of the Aluminum Company. "Dream fuels" probably won't be at gas stations before 1960, according to D. P. Barnard of Standard Oil (Ind.) because it will take that long to evolve refining processes for 90 octane gas without wasting crude.

In covering a few phases of plastics in wartime applications, Gordon Brown of the Bakelite Corp. displayed numerous samples of laminated sheet materials that had been heat softened and formed into simple shapes, also plastic-filled cloth employed to make built-up structures of difficult form. The latter, made over air bags and often with the aid of hat presses, use low-temperature, low-pressure cycles to produce parts of exceptional lightness and impact strength. As many as 40 pieces of cloth with plastic filler have been wrapped over a form and molded in a few minutes.

Selection of steels in the future will be based more upon physical and mechanical requirements than chemical composition, said W. P. Eddy, Jr., of General Motors Truck & Coach. Hardenability specifications are coming, he continued, and a few large users are already so specifying material. Use of special addition agents to make needled steels will expand as the result of hardenability specifications and search for lower costs. Less alloy will be used. NE steels may be reduced to a single group, either the 8600 or a revived 8700 series, but their carryover into peacetime depends upon elimination of certain cost extras.

Low-carbon sheet and strip (0.12 percent carbon or SAE-AISI 1008 and 1010) are excellent for fabrication of completed structures by spot and seam welding, but have relative low strength-



Incoming president W. S. James, left, congratulated by Mac Short, retiring

W. G. McCortney of the Chrysler Corp. welcomes L. W. Kempf of Aluminum Company of America and Gordon Brown of Bakelite Corp. to an SAE session on materials. Mr. Kempf spoke on the future of aluminum in postwar engine and chassis utilization, and Mr. Brown exhibited scores of aircraft parts which showed some wartime gains in production of light-weight and lower cost plastic items

1944 SAE OFFICERS

PRESIDENT—William S. James, chief engineer, Studebaker Corp. VICE-PRESIDENTS: **Aircraft**—R. D. Kelly, United Air Lines Transport Co.; **Aircraft-engine**—A. T. Gregory, Ranger Aircraft Engines; **Diesel-engine**—A. J. Blackwood, Standard Oil Development Co.; **Fuels and lubricants**—J. R. Sabina, E. I. duPont de Nemours & Co.; **Passenger car**—E. H. Smith, Packard Motor Car Co.; **Passenger-car body**—E. C. DeSmet, Willys-Overland Motors; **Production**—J. E. Hacker, Cleveland Diesel Engine Div., General Motors; **Tractor and Farm Machinery**—O. R. Schoenrock, J. I. Case Co.; **Transportation and maintenance**—E. W. Templin, Los Angeles Bureau of Power and Light; **Truck and bus**—E. M. Schultheis, Clark Equipment Co.

weight ratio in the soft condition. Dr. H. E. Romine, Metallurgical Div., Carnegie-Illinois Steel Corp., reported mechanical properties of this material when cold-rolled to yield strengths of 25,000-100,000 lb. per sq. in. Maximum bending radii were presented for various degrees of cold-working, plus thickness tolerances permissible with cut sheet and strip.

Increased production and quality and decreased scrap are products of quality control of engineering materials, as vested over the last two years in

J. L. McCloud

W. P. Eddy, Jr.

the hands of Chemical and Metallurgical Department, Ford Motor Company. Complete specifications, covering operating methods and testing procedures, have been evolved for all operations carried out by the Ford plants, according to R. H. McCarroll and J. L. McCloud. These go all the way from raw material to the finished product and are enforced by personnel of the above department, not manufacturing inspection, although the standards were originally set up in conjunction with the production and engineering departments.

Analyze Fasteners

Design of fastenings for aircraft (50 percent of the cost of an airframe lies in making joints) may shortly be done by analytical methods, which will avoid laborious static and fatigue testing. E. S. Jenkins of Curtiss-Wright described a new ring-type gage used to check deformations of spot welded and riveted joints, and presented a mathematical method of analyzing the efficiency of a continuous cemented joint in aircraft structures.

Dr. H. E. Romine

E. S. Jenkins

Names in the News

A. M. Donze, for the past eight years factory manager of Timken Roller Bearing Co., Canton, Ohio, has been advanced to vice president in charge of production. He has been associated with the company since 1919, having been production manager, factory manager, and was named a director in 1940. **John E. Fick,** superintendent of the Steel & Tube Div. of Timken, has become vice president in charge of that division. He joined the firm in 1921 and has been general superintendent since 1937.

K. E. Sutton, who has been associated with Wright Aeronautical Corp., Paterson, N. J., since 1929, has been advanced to manager of the Wood-Ridge plant, while A. M. Scheerer, experimental engineer with the firm for the past eight years, has been appointed engineering manager.

B. C. Gould, manager of operations of Murray Corp. of America, Detroit, for the past two years, has been elected vice president in charge of operations.

Named Timken Vice Presidents

A. M. DONZE

JOHN E. FICK

Murray Operations Head

B. C. GOULD

Charles O. Guernsey has resumed his position as vice president of J. G. Brill Co., Philadelphia. For the past 20 months Mr. Guernsey had been serving in an administrative capacity with the Philadelphia Ordnance District.

Harold E. Pridmore, vice president of International Molding Machine Co., Chicago, has been named president to succeed his father, Edward A. Pridmore, who died last spring. **Harry D. James, Jr.** has become vice president of the company.

Willis Rabbe has been named vice president and a director of Le Roi Co., Milwaukee, succeeding J. R. Frantz, who is retiring.

Rowland Burnstan, executive vice president of Lawrance Aeronautical Corp., Linden, N. J., has been elected president to succeed Charles L. Lawrance, founder of the company, who becomes chairman of the board.

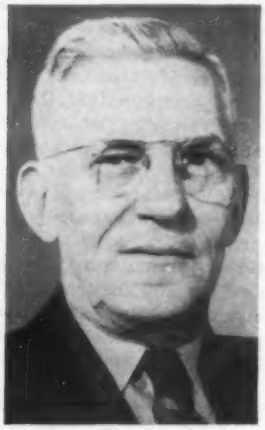
Charles L. Turner has been named to the position of vice president in charge of sales of Buffalo Bolt Co., N. Tonawanda, N. Y.

Henry Rowold has been advanced to the position of vice president of Mack-International Motor Truck Corp., Long Island City, N. Y. Mr. Rowold joined the Mack organization in 1919, later becoming executive assistant to the president.

Herbert L. Rawlins has been named manager of the protective devices engineering department of Westinghouse Electric & Mfg. Co., E. Pittsburgh. Previously he was assistant manager of circuit breaker and protective devices engineering.

Paul D. Mallay has joined Lukens Steel Co., Coatesville, Pa., as manager of the railroad division. From 1925 to 1934, Mr. Mallay held the positions of chief engineer of the transportation department and manager of the transite pipe department of Johns-Manville Sales Corp., New York, N. Y. Recently, he was railroad representative in the southeastern territory for Garlock Packing Co., Palmyra, N. Y. **Pinkney W. Love,** for the past several years a special representative for Lukens in Washington, D. C., has become manager of that office.

Becomes Vice President



R. H. HEBERLING

Ralph H. Heberling, assistant to the president in charge of manufacturing, has been appointed vice president of Edward Valve & Mfg. Co., E. Chicago, Ind. He will continue to supervise all manufacturing activities.

BUSINESS ITEMS

Warner & Swasey Co., Cleveland, has purchased the manufacturing rights for the Bakewell tapping machine from **Bakewell Mfg. Co.** of Los Angeles. The equipment will be known as the Warner & Swasey precision threading and tapping machine, and production is being transferred to the company's Cleveland plants. Sales will be handled by the same branch offices as the Warner & Swasey turret lathes.

Suprex Co., Ferndale, Mich., manufacturer of precision gages, ground thread taps and form tools, has been purchased by **N. A. Woodworth Co.** of that city.

Michigan Tool Co., Detroit, has expanded its factory service and sales to include district offices in Indianapolis and Pittsburgh. Joe R. Armstrong is manager of the former office which is located at 1109 Fletcher Trust Bldg.; while A. Olson has been named manager of the Pittsburgh office at 1217 Grant Bldg.

Midwestern Magnesium Co. of Illinois will operate a plant for the production of magnesium castings in the Chicago metropolitan area. Joseph E. Bell is vice president in charge of operations. The company is a subsidiary of Midwestern Magnesium Co. of Garrett, Ind.

Western Electric Co. has leased buildings at 245 Thirteenth St. and 745 R. St., Lincoln, Neb., to meet the need for additional production of communications equipment.

Louis Malcolm Edgar, 1500 Cadillac Sq. Bldg., Detroit, has been named sales and engineering representative for Kelly Reamer Co. for Michigan.

Eshelman & Potter, Birmingham, Ala., and Charlotte, N. C., have been appointed representatives of Edward Valve & Mfg. Co. for southeastern United States.

Robert H. Clark Co., Los Angeles, has moved to its new plant at 9330 Santa Monica Blvd., Beverly Hills, where it has enlarged facilities for production of adjustable cutting tools and automatic tapping machine conversion unit.

Titeflex, Inc. is the new name of Titeflex Metal Hose Co. of Newark, N. J. The company has been specializing in the manufacture of flexible metallic tubing since 1914, but has more recently become a producer of radio and ignition shielding for aircraft and automotive engines.

Irrgang Engineering Co. has been organized by Louis Irrgang with headquarters at 744 Broad St., Newark, N. J., to assist manufacturers as consultant engineer on metal stampings. Mr. Irrgang was recently manufacturing engineer with Western Electric Co.

W. P. Nevins Co., Chicago, has been appointed sales and engineering representative in that territory, including Lake and Cook counties in Illinois and Lake and Porter counties in Indiana, for Young Radiator Co., maker of heat transfer products in Racine, Wis.

OBITUARIES

Henry E. Miller, president of Chicago Wheel & Mfg. Co., Chicago, died at his home there after a brief illness. In 1894 Mr. Miller was made manager of the Chicago Emery Wheel Co., which he later purchased. The following year he became president and changed the firm's name to Chicago Wheel & Mfg. Co. He introduced a number of important innovations in the abrasive industry, and has been credited with being one of the first to mount small wheels on steel shanks for use in various professions and trades. Mr. Miller was one of the founders of the Grinding Wheel Manufacturers Assn.

Henry E. Miller

Alfred Fritzche, vice president and general manager of Automatic Sprinkler Corp. of America, Youngstown, Ohio, and well known industrialist of Cleveland, passed away at the age of 74. Mr. Fritzche had been an executive of Automatic Sprinkler since 1937 following his resignation as vice president and general manager of General Fire Extinguisher Co., Providence, R. I.

George U. Birkenstein, 44, president of Anker-Holth Mfg. Co., Chicago, Ill., and Port Huron, Mich., passed away following a long illness. He had been active in representing the non-ferrous metal trade in negotiations with WPB and OPA, and in 1942 conducted a special survey in Washington for the Conservation Div. of WPB.

Garnet W. McKee, 66, president and founder of Eclipse Fuel Engineering Co., Rockford, Ill., passed away in Madison, Wis., recently.

Charles H. Warner, co-inventor of the automobile speedometer and other motor accessories, died in California at the age of 71. With his brother he founded the firm which later became the Stewart-Warner Co., Chicago.

Joseph Stuart, vice president of Lobdell Co., Wilmington, Del., died at the age of 78 following injuries received in an automobile accident.

Allan E. Hall, 70, manager since 1920 of the milling machinery department of Allis-Chalmers Mfg. Co., Milwaukee, died after a long illness.

MEETINGS

American Foundrymen's Assn. War production congress and show. Memorial Auditorium, Buffalo, N. Y. Apr. 25-28.

American Gas Assn. War conference. Hotel Seneca, Rochester, N. Y. Mar. 30-31.

American Management Assn. Annual conference of personnel. Palmer House, Chicago, Ill. Feb. 9-11.

American Society of Mechanical Engineers. Spring meeting. The Tutwiler, Birmingham, Ala. Apr. 3-5.

American Society for Testing Materials. Spring meeting. Netherland Plaza, Cincinnati, O. Feb. 28-Mar. 3.

American Society of Tool Engineers. Annual meeting. Bellevue Stratford Hotel, Philadelphia, Pa. Mar. 26-27.

National Electrical Manufacturers Assn. Spring meeting. Palmer House, Chicago, Ill. Apr. 24-27.

Shop Equipment News

Landis Type CH Plain Hydraulic Grinders Improved And Available in Two Sizes and Six Bed Lengths

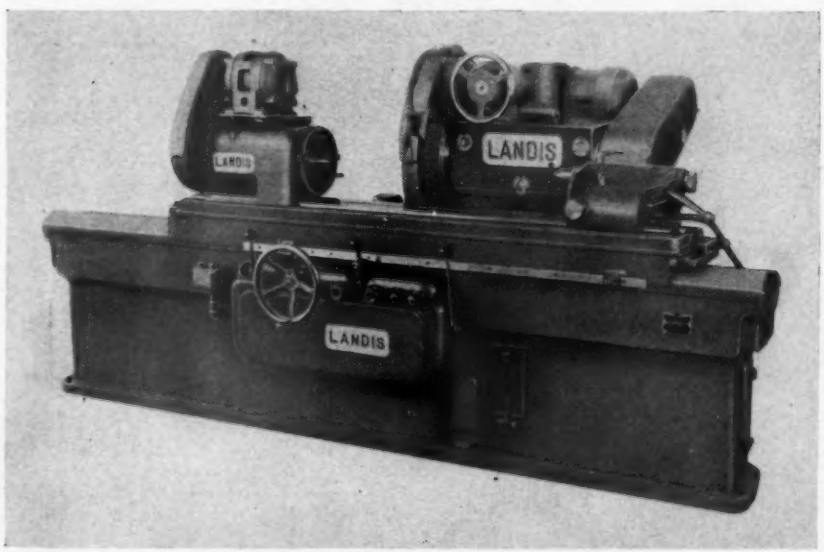
Several improvements and refinements have been incorporated in the Landis 10- and 14-in. plain hydraulic grinders manufactured by the Landis Tool Company, Waynesboro, Penna. The redesigned machines have been designated Type CH.

Many of the machine's improvements center about the wheel feed mechanism, which has been completely redesigned. A large micrometer ring at the rear of the feed-up handwheel permits accurate setting for the desired amount of hand feed. Graduations on the hand ring are normally read in thousandths, in terms of work diameter reduction. One simple adjustment permits the same graduations to be read in tenths of thousandths.

Automatic wheel feed, considered standard on power traverse machines, is built into the wheel base. It is automatically reset at the end of each grinding cycle without the operator being required to change position of the wheel feed handwheel.

Many special features not previously available for this type of machine are now obtainable as are all of the former special features.

Both the 10- and 14-in. swing machines may be had in 18, 36, 48, 72, 96 and 120 in. lengths. The standard grinding wheel is 30×3×12 in. The headstock is powered by a 1 hp. constant speed motor and the wheel by a 10 or 15 hp. motor.



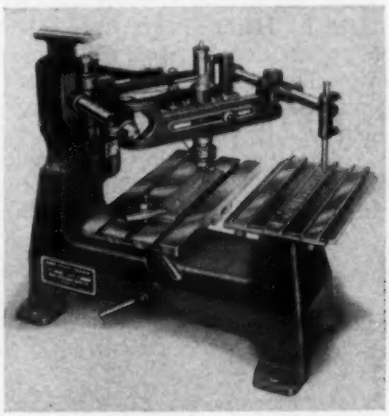
Landis Type CH plain hydraulic grinder

Preis Pantographic Engraver For Cutting and Etching

The UE-3 Panto engraver produced by H. P. Preis Engraving Machine Co., 157 Summit St., Newark 4, N. J., is suitable for engraving on all metals and plastics, for electrical marking on steel and other ferrous metals, and for acid etching on metals or glass.

This machine can be equipped with a forming guide attachment to engrave on concave, convex, spherical and beveled surfaces. A depth-of-cut regulator is available to engrave on uneven or curved surfaces. Pantograph ratios range from 1.7:1 to 7:1, with the main ratios marked on the bars and any intermediate ratio obtainable from a pantograph chart furnished.

The cutter spindle has adjustable ball bearings and is held in the spindle bracket with a bayonet type lock. It is of a collet clamping design and can be used with straight shank or tapered shank cutters. The machine is equipped with endless belt drive,



Preis pantographic engraver

and has four spindle speeds ranging from 5,000 to 12,000 r.p.m. The cutter is fed to the work with a cam-actuated drop lever, the feed screw collar being graduated in 0.001 in. Total vertical feed is 5/16 in. Maximum distance from the cutter point to the work table is 3 in. Standard 6×12 in. work table with three T-slots is adjustable both horizontally and vertically.

This machine can be converted for electrical marking or acid etching by replacing the spindle bracket with a standard Panto marking or etching units.

Sylvania Fluorescent Unit Mounts Two 100 Watt Lamps

Model HF-235R industrial fluorescent unit has been developed by Sylvania Electric Products Inc., Lighting Div., Salem, Mass., for areas where high levels of illumination are required, or where high-bay mounting is necessary. The unit uses two 100 watt lamps and is of the same basic streamlined design as the recent 40 watt lamp models.

This fixture is suited to individual

or continuous row mounting and may be suspended by direct chain suspension, conduit mounting, messenger cable clamp assembly or surface mounting with bolt or lag screw.

The one-piece non-metallic reflector board is finished in Miracoat enamel and is said to provide high reflectivity. Location of starters between lamps provides ease in maintenance. A joining strap adapts the unit for continuous installations.

Harnischfeger Adds New Model To Welding Positioner Line

A 2,500 lb. capacity model WP-2 welding positioner is being manufactured by Harnischfeger Corp., 4400 West National Ave., Milwaukee, Wis. The table is 42 in. in diameter and has 18 radial slots for mounting fixtures. It turns manually to suit welding speed. Tilting is controlled by hydraulic power with 135 deg. beyond horizontal position attainable.

Harnischfeger welding positioner

Both table movements have positive locking devices.

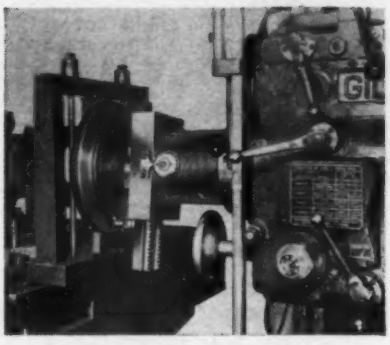
Telescopic column with self-locating stops provides for table elevation from 28 in. minimum to a maximum of 60 in. from the floor, depending on the type of mounting. Portable or column-in-floor mountings are available.

Available extra equipment includes electric power or ring gear and handwheel assembly for table turning with foot or pushbutton control, higher than standard columns in increments of 1 ft., and roller equipped outboard supports for handling long or large weldments. Equipment is also available for power table rotation giving constant speed of 1 r.p.m.

Regent Facing and Boring Head For Horizontal Boring Bar Use

For use on horizontal boring bars, Paper Converting Machine Co., Green Bay, Wis., has produced the Regent selective automatic feed facing and boring head. The tool is available in two sizes, the Model 20 with a range from 0 to 24 in. diameter and Model 10 with a range from 0 to 12 in. diameter.

This head utilizes the forward and backward feed mechanism of the boring bar to automatically outwardly or inwardly feed the toolholder slide. Thus a wide range of cuts is provided for roughing and finishing. This attachment is bolted to the spindle face of the boring bar, enabling the use of the bar feed mechanism to operate and control the mechanism in the head. Micrometer feed adjustment is incorporated in the toolholder.



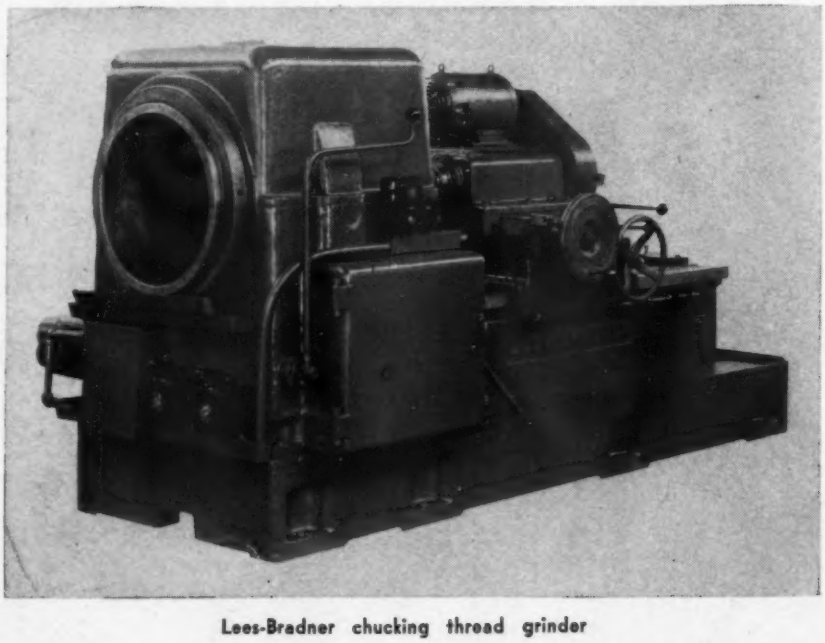
Regent facing and boring head

Lees-Bradner Heavy-Duty Chucking Thread Grinder Developed for Increasing Sizes of Plane Components

Larger sizes of component parts in the strut and propeller portions of the aircraft industry has led to the development by the Lees-Bradner Company, Cleveland 11, Ohio, of the Model SCT heavy-duty chucking thread miller. It is designed to handle parts of such size that they could not previously be handled by the ring-type thread milling process. This machine has a 22-in. bore through the work spindle.

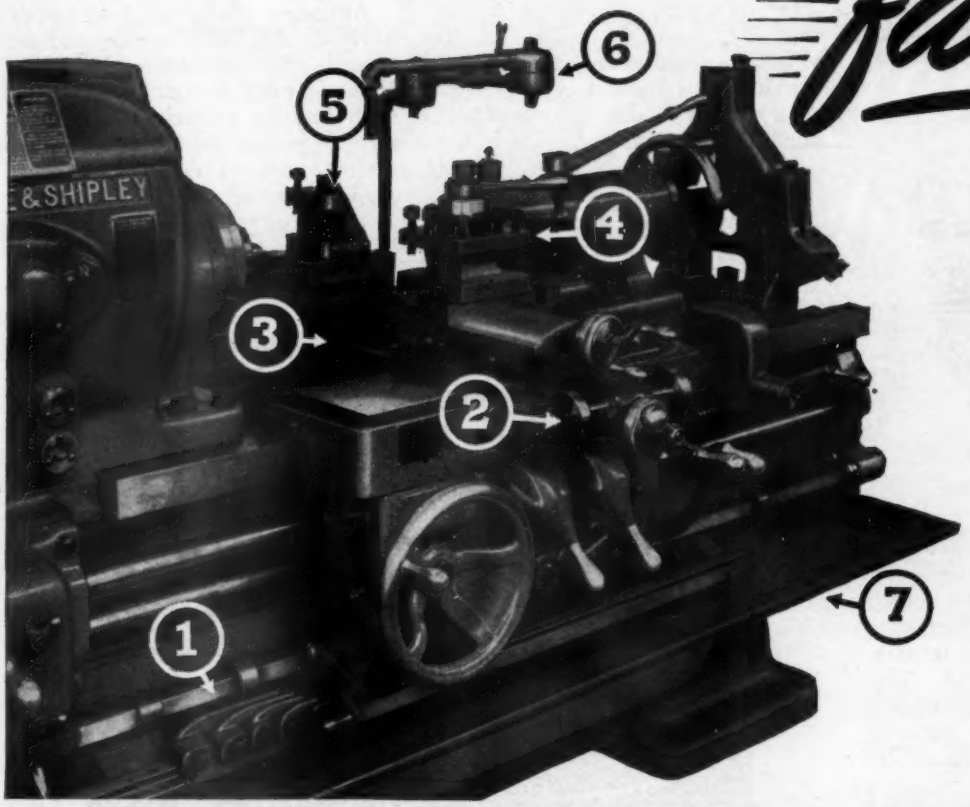
The machine is powered by four separate electric motor drives, one for the work spindle, one for the cutter spindle, a third for the power traverse and the fourth for the coolant pump.

A new type of construction in thread milling machine practice has been used in the design of the cutterhead to permit rapid and accurate positioning. This consists of a combination drive to the cutterhead so that it may be traversed along the bed by means of a separate motor arranged with an integral brake. This development makes it possible to move the cutterhead back and forth along the bed rapidly and, by means of the adjustment provided by the handwheel, to fine limits of accuracy.



Lees-Bradner chucking thread grinder

Produce SMALL Lots *faster*



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Original Navy "E" Awarded March 6, 1942

Why you save time with The Lodge & Shipley Manufacturing Lathe

Change over quickly and easily from one job to another.
Advantageous use of multiple tools and universal holders.
Transfer of diameter and length control from operator to lathe.

OUTSTANDING FEATURES

(1) Multiple Length stops (Telescopic Dog Type), automatically disengage longitudinal feeds.

(2) Multiple Diameter Stops, for both front and rear tools, can be quickly indexed for establishing diameters. Time wasting "cut and try" eliminated.

(3) Connected rear rest increases tooling possibilities. Adaptable to single or multiple tools.

(4) Four-way tool block on compound rest can be indexed for twelve equally spaced tool positions.

(5) High duty tool block in rear used for single tool can be supplemented or replaced with multiple holder.

(6) Coolant pump and piping.

(7) Chip pan.

WRITE FOR PUBLICATION No. 482

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC OIL COUNTRY LATHES

Federal Gage Is Adjustable For Thread Lead and Diameter

Federal Products Corp., 1144 Eddy St., Providence 1, R. I., has produced the Model 1141 thread lead inspection gage which will handle threads up to 1½ in. in diameter, a maximum distance of 2 11/16 in. between points and a minimum distance of 3/16 in. With a special attachment a minimum distance of 0.156 in. can

Federal thread lead gage

be checked. The dial indicator is graduated to read in 0.0001 in.

This gage is adjustable for thread lead and diameter. The sensitive contact point is free to float laterally with the axis of the thread. This contact is so mounted that it transfers its motion to the dial indicator through a sensitive mechanism. The gage is set with a master.

Hill-Bartelt Grinding Fixture For Milling Cutter Teeth Arcs

For profile grinding 180 deg. radius or any lesser arc form on the teeth of milling cutters from 3 to 6 in. diameter and up to 1 in. thick, Hill-Bartelt Machine Co., 229 South Church St., Rockford, Ill., has produced a radius grinding fixture for use on standard tool grinding machines.

The rotating cutter is clamped on a plate extending from a head which

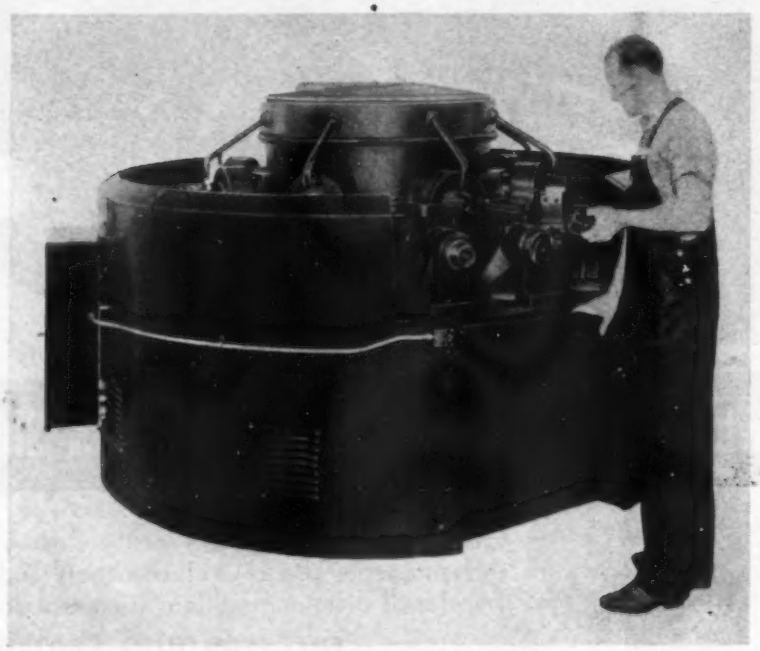
Hill-Bartelt radius grinding fixture

has two micrometer adjustable cross-slides operating at right angles to each other. The head is carried on a shaft which is swung by hand through the desired arc, using a handwheel on the other end of the shaft. The shaft bearing is located at the top of a pedestal that swivels to obtain the back-off angle. Two slots for bolting the fixture to the table are provided in the base to which the pedestal is clamped.

Indexing is manual, with a conventional adjustable spring finger stop. The arc through which the head is swung can be controlled by adjustable stops on a plate back of the handwheel. An arc scale on the back of the head provides visual indication of the amount of swing. Thumbscrews allow for clamping the cross-slides in position, and adjustable wear gibs provide take-up of any looseness in the slides. A spring pin in the top of the shaft bearing will engage holes in the shaft to fix the cutter in either vertical or horizontal position.

Although designed for radius grinding, this fixture can be used for several other operations. With the cutter in fixed position, side cutting teeth may be ground. Tooth faces may be ground radially or with any desired hook or rake. A 90 deg. round corner of any radius up to ½ in. may be ground on cutter teeth within the specified size.

Snyder Eight-Spindle Rotary Turning Machine Performs A Single Operation in Multiples of Eight on Various Parts



Snyder eight-spindle rotary turning machine

An eight spindle rotary turning machine has been built by Snyder Tool & Engineering Co., 3400 East Lafayette Ave., Detroit 7, Mich., for performing a single operation in multiples of eight or a succession of operations in multiples of four on various types of parts such as hubs, pistons and flanges. The eight work spindles and their drive mechanism and tool slide supports are mounted upon a large circular turntable. Each spindle is an individual turning and facing machine with its own set of toolblock.

In operation, the large turntable revolves slowly, bringing each of the eight spindles in turn to the loading station. While the spindle passes the loading station, it does not rotate and the tools are retracted to permit unloading and reloading in safety. At a point safely beyond loading position, the tools advance and feed into the work as the spindle starts to revolve. Each spindle performs a complete operation upon the part while it rotates and while the turntable carries the operating assembly around the circle.

THESE are the quality features you get with every Standard Carboloy Tool:

Cold drawn steel shanks—with the strength to "take it" on even the "toughest" jobs. Full-size Carboloy Tips—amply large to permit grinding to wide range of special shapes. Extra-strong braze—copper braze—of tip to shank. Cutting rakes and angles accurately incorporated for wide range of work. Each tool diamond-ground, ready to *start* cutting and *keep* cutting for long periods of operation. Entire tool shank area colored for instant, unmistakable identification.

These and other quality features of Carboloy Standards are available to you at prices comparable to all types of cutting tool materials—prices made possible by unprecedented demand and mass production economies.

Stocked in 10 styles, wide range of sizes and five standard grades. Write for new catalog GT-175.

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For Cutting CAST IRON and Non-Ferrous Metals
For Cutting STEEL

TUNGSTEN CARBIDES ★★★ TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES

Although each station is equipped with identical tooling, the machine can also be arranged to perform successive operations by setting up four spindles to perform one operation and the next four to perform another operation.

Herman Stone Has Granite Portable Surface Plate

Herman Stone Co., 324 Harries Bldg., Dayton 2, Ohio, has produced a portable granite surface plate which measures 4×6 ft. and weighs 5,000 lb. An angle iron wheel carriage facilitates handling and makes the plate available for service in any part of a plant.

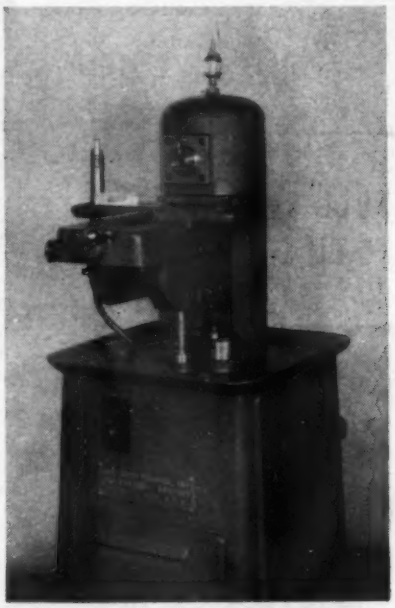
This plate and a 6×8 ft. size may be finished to an accuracy of 0.0003 in., while the standard smaller sizes are held to an accuracy of 0.0001 in.

Superior Machine Slot Miller Has Head Which Oscillates in an Arc While End Mill Revolves

The Superior Slot Miller has been developed by the Superior Machine & Engineering Co., 1930 Ferry Park, Detroit 8, Mich. Designed to cut slots in pieces of various shapes and sizes, the mill operates with the head oscillating in an arc while the two-lip end mill used is revolving. The part to be slotted is held in a fixture on the work table and is fed to the oscillating spindle at each end of the stroke.

Amount of feed to the table is adjustable and operation automatic. The feed is automatically stopped at the end of the cutting action, or can be stopped manually at any time. Slot width is determined by the size of end mill used and length of slot by the chord of the arc of oscillation.

Capacities of the machine are as follows: automatic table feed, 4 in.; table working surface, 3½×13 in.;

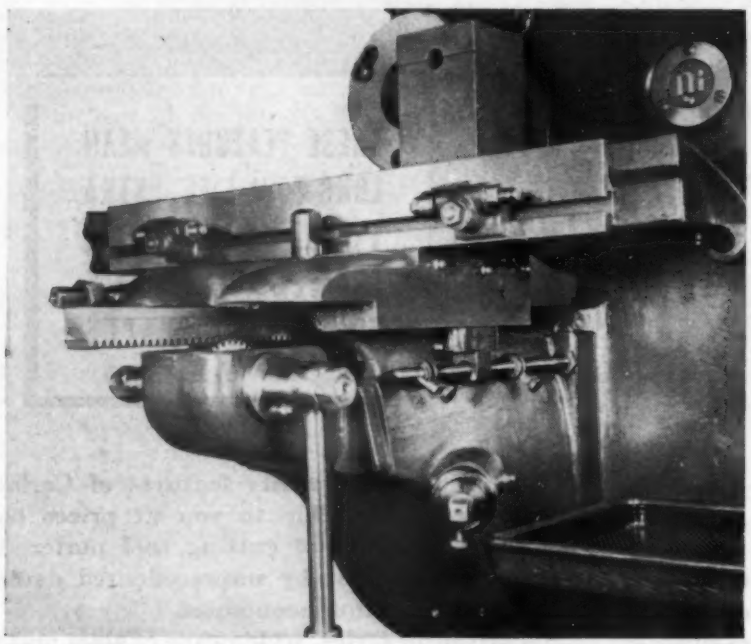


Superior slot miller

spindle speeds, 1560 to 2040 r.p.m.; oscillations (6 speeds), 32 to 93 per min. and maximum capacity of cutter, ⅝ in.

The slot miller is 51½ in. high and weighs 760 lb.

Transverse Feed on Nichols Milling Machine Achieved Through Use of Lever, Rack and Pinion Assembly



Nichols miller transverse feed

The Nichols milling machine, distributed by the Nichols-Morris Corporation, 50 Church St., New York, N. Y., has recently been improved by the addition of a transverse feed achieved through a lever, rack and pinion. It can be used instead of the regular transverse feed screw to give greater flexibility.

Principal advantage of the new feed, as described by the makers, is that it gives the milling machine table the same flexibility of movement as is to be found in the conventional lathe carriage and cross-slide. Work can be chucked, lathe fashion, on the spindle with tools mounted on the table, or vice versa. Thus, the miller may be used for counterboring, turning, profiling and recessing. Close tolerances can be held on repetitive operations with adjustable stops.

Bruning Photographic Printer Duplicates Typing, Drawings

Charles Bruning Co., 100 Reade St., New York, N. Y., has available the 55C continuous photographic printer for duplicating typed, printed, photographed or drawn material. It is a 42-in. printer which requires a floor space of 40×62 in. This printer may be used either inside or outside of the dark room, and operates either with roll stock or cut sheets. A constant speed motor drives the variable speed transmission which is controlled by a knob within easy reach of the operator's hands. Further control of exposure is obtained by a shutter arrangement which varies the exposure space from 0 to 14 in.

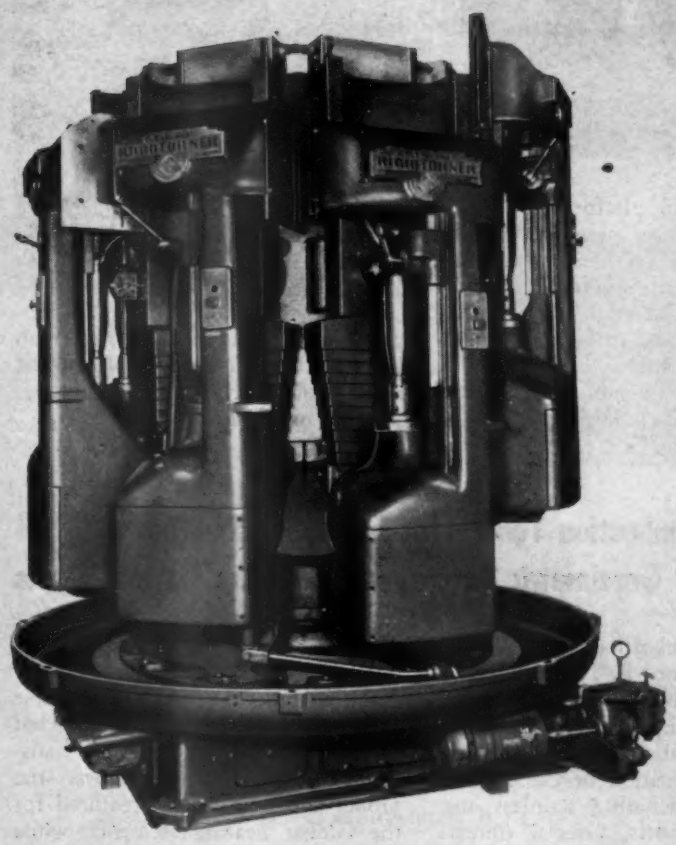
A 9-in. Pyrex cylinder revolving contact with 22 individual 2-in. bands assures that originals and sensitive materials remain in register, and prevents slippage. A feature of

FOR MASS PRODUCTION OF VITAL SHELL

THE RIGIDTURNER

The NEWEST Thing in Multiple Diameter Turning

ROTARY MODEL



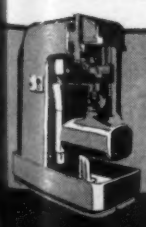
The Rotary Model Rigidturner is designed for the mass production of duplicate work on which there are various diameters to be turned.

The use of eight spindles all operating at one time, continuously, insures the maximum of production. Faithful duplication and continued accuracy is accomplished by the use of special form cutters.

Machine operation is automatic and extremely simple. Operator merely loads and unloads work at loading position—the machine does the rest.

The Rotary Rigidturner is making production records in many shops now engaged in turning shell up to 105 MM. The same method applied to post war operation will not only produce accurate work in quantity but turn it out at costs favorable to competing markets.

This Booklet tells what Rigidturning is—explains in detail the various functions of the machine—and shows its advantages for high production of accurate work at low costs. Write for your copy today.



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BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

Bruning photographic printer

the 55C is the large print return tray which occupies the entire top of the machine.

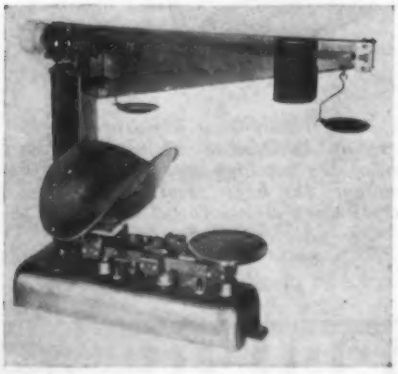
The originals enter the tray on top of the print. By means of a foot pedal, the operator can reverse the travel of prints through the machine instantly. The feed board is illuminated to facilitate handling, and all controls are individually illuminated by ruby or safe lights.

This machine is wired for 100 volts a.c. 60-cycle, or 220 volts, d.c. It is mounted on casters and is finished in two-tone green crinkle finish.

Detecto-Gram Counting Scale Handles Small, Light Pieces

For counting very small, light pieces, Detecto Scales, Inc., 4 Main St., Brooklyn 1, N. Y., has produced the Detecto-Gram counting scale Model 66-02. The scale has a sensitivity of 1/64 oz., and is equipped with an over and under dial which shows up a discrepancy of one piece more or less than the desired count.

The two counting pans are arranged on a 10:1 and 50:1 ratio. Capacity of this scale is 6 lb.

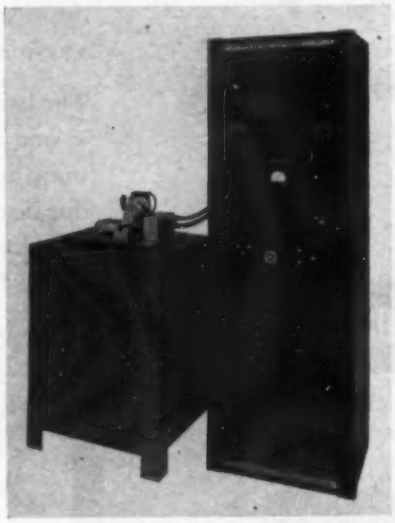


Detecto-Gram counting scale

Sonntag Electrodynascope Measures Rotor Unbalance

The Electrodynascope, for directly measuring the added alternating bearing forces exerted by the unbalance of a rotor, is being manufactured by Sonntag Scientific Corp., Greenwich, Conn. Alternating unbalance forces are transmitted by a practically rigid platform to quartz crystals producing piezo-electric potentials which are magnified by vacuum tube amplifiers, and made visible on the screen of a cathode ray oscillograph. The magnitude of the unbalance, ultimately expressed in ounce-inches or depth of drilled or milled holes, is indicated as a sine wave pattern, representing magnitude and location of unbalance.

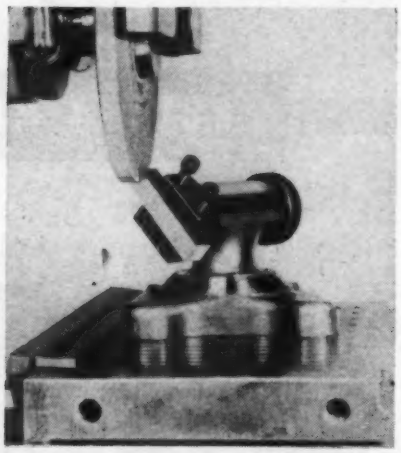
The equipment is available in standard models up to 75 lb. rotor weight for speeds up to 12,000 r.p.m.



Sonntag Electrodynascope

Boyar-Schultz Makes Fixture For Grinding Screw Machine Bits

Model G universal toolbit grinding fixture has been developed by Boyar-Schultz Corp., 2110 Walnut St., Chicago 12, Ill., for use on surface grinders. It is said that inexperienced operators can quickly produce uniformly ground toolbits for both right- and left-hand screw machine tools.



Boyar-Schultz grinding fixture

Any desired chip breaker angle can be ground to suit any type of material or condition. Settings provide for repeating any desired angle.

Lindberg Combustion Tube Furnace for the Laboratory Used for Gravimetric Determination of Carbon and Steels

The CF-1 combustion tube furnace has been designed by Lindberg Engineering Co. 2444 West Hubbard St., Chicago 12, Ill., for carbon and sulphur determinations as well as gravimetric determination of carbon and alloy steels, including stainless and heat-resisting steels. Over-all dimensions of this furnace are 17½×15×21½ in. high. It operates on 110 or 220 volts, 60-cycle a.c. Units to operate at 25-cycle current can also be supplied.

Temperatures obtainable for continuous operation are up to 2,500 F., while for occasional operations temperatures up to 2,650 F. are permissible. High temperature Globar elements can be installed without totally dismantling the unit. Temperature regulation is provided by coarse and fine adjustment knobs connected to a built-in variable voltage transformer. An ammeter shows the proper and safe current required for the Globar heating elements, while the temperature is indicated by a pyrometer connected to a thermocouple.

A knob for controlling the flow of oxygen operates a needle valve connected to rubber tubing adapters located at both ends of the housing. The control includes a line cut-off switch and a signal light which shows when the furnace is operating.

The Adirondack Foundries and Steel Corporation with contracts for gun forgings knew that these forgings tend to warp during heat treatment and therefore require means for straightening. For this purpose Baldwin designed this special 350-ton self-contained, oil-operated, high speed straightening press. This press not only possesses sensitive control as to the movement of the straightening tool but is also equipped with adjustable supports and rotating device for placing the forgings in the desired strengthening positions.

Everywhere, in all types of industry, Baldwin presses are helping to take out the kinks in knotty production problems. Perhaps we can help you! Write for bulletin No. 181. The Baldwin Locomotive Works; Baldwin Southwark Division, Philadelphia, Pa., U. S. A. Pacific Coast Representative, Pelton Water Wheel Co., San Francisco, California.

BLW THE BALDWIN GROUP

BALDWIN
SOUTHWARK
HYDRAULIC PRESSES

Lindberg combustion tube furnace

The unit has three adapters for easy interchangeability of standard combustion tubes 1, 1¼ and 1½ in. outside diameter. A fourth tube of 2 in. outside diameter can be used without an adapter.

Hollywood Torch for Heating And Melting Various Metals

For preheating and melting various metals, Hollywood Foundry & Machine Co., 21st Ave. & Hayes St., Hollywood, Fla., is making a torch which is available in small, medium and extra long sizes. Kerosene, furnace oil or distillate used with the torch operating with a 60 lb. minimum of compressed air attains temperatures up to 1,800 F. These torches are available in three sizes.

New Britain Tube Cutter Has Self-Feeding Feature

New Britain Machine Co., New Britain, Conn., is offering Model T 120 self-feeding tube cutter which handles all tubes, whether copper, brass or lead in sizes from ⅛ to ⅝ in.

New Britain tube cutter

diameter. This tool is 4½ in. long and weighs 3 oz.

After the tube is inserted in the cutter and tightened, it does not have to be reset. The tension in the frame automatically gives a deeper cut on each turn until the tube is severed.

Chandler Boring Tool Head For Turning and Undercutting

A boring and facing tool head for the jig borer, drill press and milling machine has been developed by Chandler Tool Co., 514 Ohio Ave., Muncie, Ind. Capacity of this Chandler-Duplex tool head is from the smallest holes up to 8 in. in diameter. The standard tool is 3 in. in diameter and 3⅞ in. long, and weighs 9 lb. Maximum slide travel is 1¼ in.

All operations such as turning, boring, facing and undercutting and recessing can be accomplished at one setting. The power feed principle used in this head is obtained through a ring gear at the top of the head which drives a pinion shaft upon which is mounted a worm. This worm engages a phosphor bronze worm gear that drives the feed screw. The feed screw moves the slide which carries the tool. When the power feed is not in use, as in straight boring, the feed ring revolves with the head. By arresting the movement of

Chandler boring and facing tool head

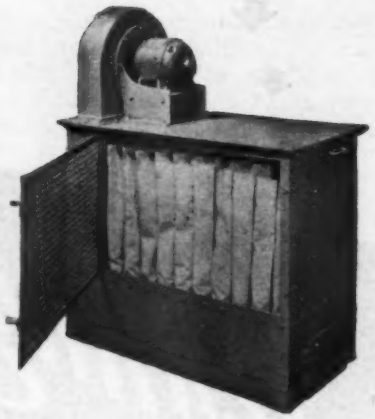
this ring as the head revolves, the dovetail slide is caused to move radially 0.005 in. per revolution.

In straight boring a sensitive adjustment may be obtained owing to the worm gear reduction. By engaging the worm gear the dovetail slide can be moved in increments of 0.0001 in. by direct reading on the calibrated feed ring at the top.

Norblo Dust Collection Units For Light and Intermittent Use

A line of bag-type portable dust collection units, ranging from 300 cu. ft. per min. up and having up to 8 in. static pressure at the fan, has been produced by Northern Blower Co., 6502 Barberton Ave., Cleveland 2, Ohio. These Norblo units are designed for light dust loads and intermittent service. They are equipped with ¾ to 3 hp. motors.

Based on cylindrical bags with dust-laden air entering at the bottom and flowing upward inside the bags against gravity, these Norblo units embody the same principles as the



Norblo dust collection units

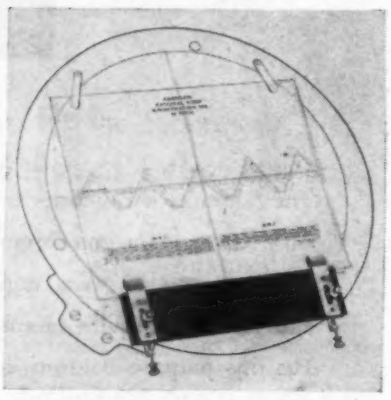
company's bag-type systems for large scale dust collection.

For wet or moist grinding or polishing, a line of impingement and filter type small units is available, ranging from 500 to 1,000 cu. ft. per min. with 8 in. static at the fan.

Universal Holding Fixture For Transparency Layouts

For using enginers' glass and transparency charts and layouts on Bausch & Lomb and Jones & Lamson projectors and comparators, Universal Engraving & Colorplate Co., Engineers' Specialties Div., 588 Monroe St., Buffalo, N. Y., has available two holding fixtures, one for each type of instrument.

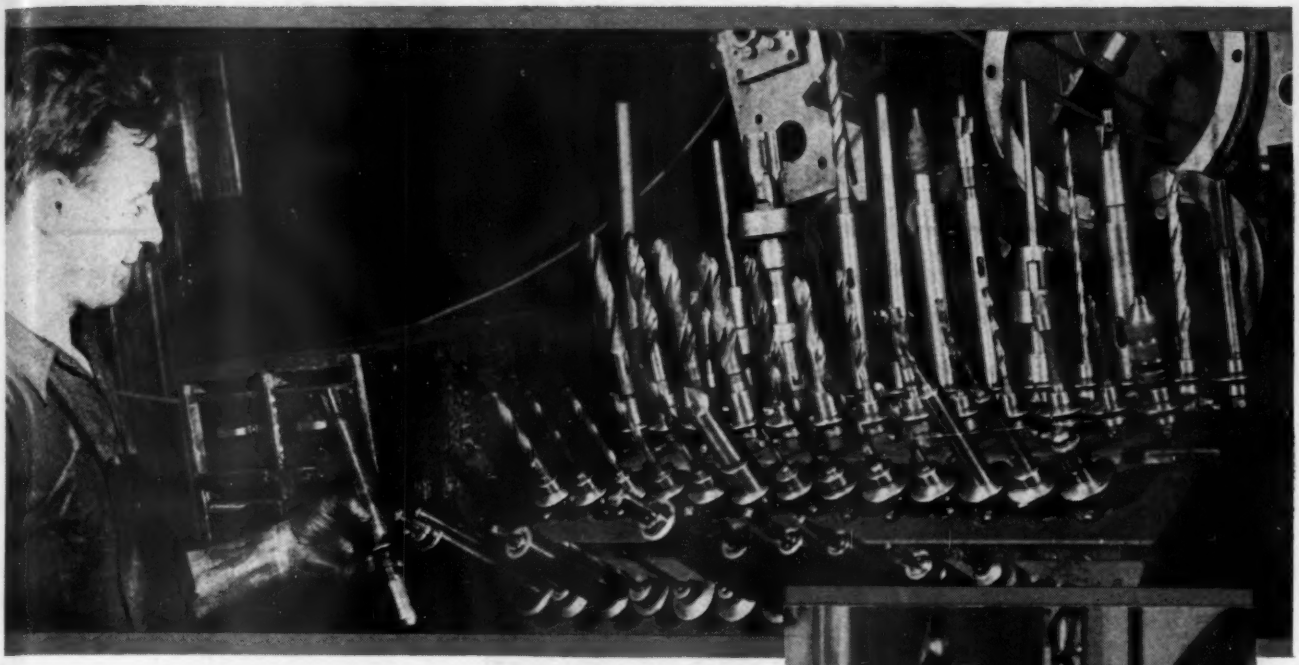
With these holders, which are easily attached, it is a simple matter

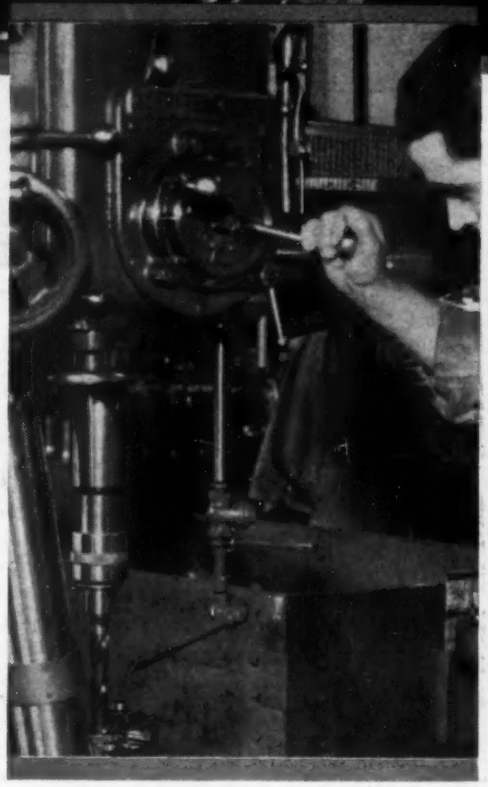


Universal comparator fixture

to check work against original drawings or charts. The holders are so constructed as to remain assembled when taken from the machines on which they are used.

The holders are available in a variety of sizes and in specialized shapes for special purposes.





READY FOR ACTION
WIZARD Quick-Change Chucks Speed-up Drill Press Jobs

IN THE HANDY RACK shown above each tool is fitted with its own WIZARD Collet. The drill-press spindle is fitted with a WIZARD Quick-Change Chuck. With this complete WIZARD Outfit the operator is ready for continuous action on multiple-operation jobs. When one tool has done its work, he can change to the next without stopping or slowing the spindle.

WIZARD Chucks hold tools rigid and centered, an exclusive McCrosky feature. With the protection given by WIZARD Friction-Drive Tapping collets the operator can bottom tap safely at drilling speed.

WIZARD Chucks are made in four different sizes. Standard Collets are available in a variety of styles for holding a wide range of tool sizes.

To help in selecting your WIZARD Outfit ask for Bulletin 16-D. To help your operators get the most action on the job ask for McCrosky Quick-Change Chuck Manual.

EST. 1904
McCROSKY
TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Parts and Materials

Chelsea Air Blaster Fan Available in Three Sizes

A fan, called the Air Blaster, is being offered by Chelsea Fan & Blower Co., 1206 Grove St., Irvington, N. J. It delivers a large volume of air in a straight line. The unit is made in three sizes: 18 in., ¾ hp., 6,000 cu. ft. per min. motor; 24 in., 1½ hp., 9,000 cu. ft. per min. motor; and 30 in., 1½ hp., 11,000 cu. ft. per min. motor.

This fan consists of a heavy gage steel housing, mounted on an adjustable pedestal which may be tilted 60 deg. up or down. It is driven by a direct-connected, ball bearing motor.

Chelsea Air Blaster fan

G. E. Has Four Vacuum Switches For Variety of Switching Uses

Four vacuum switches for a wide variety of switching applications have been announced by General Electric Co., Tube Div., Schenectady, N. Y. The GL-34 and GL-482 are designed for high altitude applications. They are also adapted to oil or water immersed operation because of their inclosed construction, and are especially applicable for hazardous installations.

The vacuum type construction gives the switches a high current rating for their size and permits them to handle enough power to operate equipment at greatly reduced voltages. Operating without auxiliary contactors or relays, the switches can be used on installations where space is at a premium. No self-contained coil or other operating mechanism is built into the switches. Movement is obtained from the mechanism to be controlled, or from other apparatus to suit the application.

G. E. vacuum switches

A flexible diaphragm transmits movement to the contacts and acts as a natural fulcrum point for the operating arm. These switches may be mounted on or near delicate instruments as the contacts close without vibration.

Executone Control Box For Microphone System

Model P566 relay and busy signal control box is being offered by Executone, Inc., 415 Lexington Ave., New York, N. Y., for connection to microphones in Executone's rack and panel amplifier sound systems. The box is suitable for wall mounting and is housed in a gray crackle finished metal cabinet 6½ in. high, 2⅝ in. wide and 1⅜ in. deep. Connections are made to terminal strips located inside the case.

This unit coordinates the operations of multiple microphones and provides an instaneous method of cutting in on central plant sound systems. Busy signal light eliminates interruption from other microphones in the same system. A talk-switch prevents accidental broadcasting of unwanted sounds, provides automatic plate voltage relay control, and automatically cuts off music broadcasting when paging is desired.

Spencer Circuit Breaker For Aircraft Application

The Klixon remote control circuit breaker has been developed by Spencer Thermostat Co., Attleboro, Mass., for aircraft and mobile applications as well as other equipment for operation and control of any remote electrical load. This breaker relay indicates circuit operation, and can be reset from a control panel. Three frame sizes are available with current ratings from 35 to 200 amp. for circuits up to and including 30 volts d.c. or 220 volts a.c.

This unit is calibrated to precision tolerances and is said to carry at least 115 percent of rated current continuously, and to ultimately trip at 125 percent of rated current in an ambient of 77 F. The actuating element in this breaker is a snap-acting

Klixon circuit breaker

AN INTRICATE DIE-PRESSED ALUMINUM FORGING

by REVERE

Weight: 1¾ lbs.; length: 9"; extreme width: 6"

The intricate die-pressed housing pictured above is really quite a job. It is typical of other difficult die-pressed aluminum forgings that Revere can supply in a wide variety of shapes and weights with a wide range of applications. The aviation industry alone has eagerly availed itself of these strong, close-grained, intricate die-pressed aluminum forgings and will attest their economy and utility. Revere forgings are also available in copper, various copper-base alloys and magnesium.

Revere will be glad to give you technical advice—*without obligation*—on any special problems that you may have in the field of die-pressed forgings. Write Executive Offices.

FREE! A 54 page manual, "Revere Copper and Copper Alloys—Technical Information for Product Designers," with 106 graphs relating to physical and metallographic properties under varying conditions; also, a new, easy-to-read chemical and physical properties chart, with pertinent illustrated information on Revere manufactured forms and welding technique. A complimentary copy sent you upon request. Address: Executive Offices.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Ave., New York 17, N. Y.

disk which is unaffected by motion, vibration or shock, according to the manufacturer.

The Klixon circuit breaker can be furnished for trip-free or non-trip-free operation. In the trip-free arrangement the breaker is free to open irrespective of the maintenance of the handle in the closed position; while in the non-free-trip arrangement the operator can override the action of the circuit breaker relay from the control panel.

Alronox Finishing Process Adaptable to Zinc Surfaces

Alronox has been developed by Alrose Chemical Co., Providence, R.I. It is said to be adaptable to all zinc and die cast surfaces and to produce an even black, corrosion resistant finish. The material is applied by immersion.

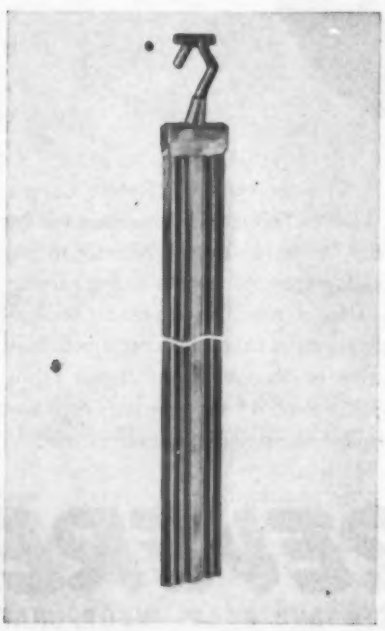
This non-electrolytic process has a salt spray rating of 200-300 hr. on 0.0002 zinc plate over steel, without after-coating. It is considered a suitable base for organic coatings.

Heil Electroplating Anode Has Multi-Angle Surface

A sawtooth lead anode for electroplating is being manufactured by Heil Engineering Co., 12901 Elmwood Ave., Cleveland, Ohio. Five hook styles are available.

One side of the anode has ten edges and the other side has a central spine ½ in. thick down the center. This spine connects directly with the hook. It is claimed that the multiple edges increase the effectiveness of the anode when used between two work rods.

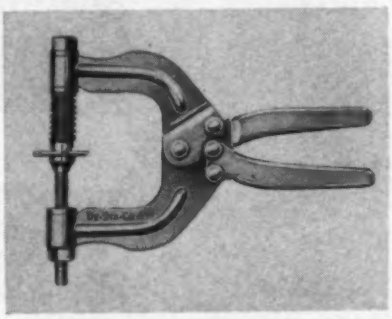
This anode is made of extruded lead and said to offer more resistance to corrosion. The hook is coated and integrally bonded to the anode to provide a continuous metal conductor.



Heil sawtooth anode

De-Sta-Co Portable Clamp For Parts of Varying Thickness

Detroit Stamping Co., 343 Midland Ave., Detroit 3, Mich., has added the De-Sta-Co No. 470 portable toggle clamp to its line. This clamp has a Pressure-Matic feature, and is recommended for use on sheet metal and other work where the individual parts to be clamped vary in thickness up to a maximum of ⅜ in. on various locations of the same fixture group. The spring provides for this variation without need for readjustment of the spindle.



De-Sta-Co. portable clamp

The 3 in. wide throat provides capacity to handle a range of work greater than average. The improved swivel foot permits clamping angles and other odd shapes. This clamp may be used for clamping metal, wood or plastic parts, for riveting, welding, gluing or other production operations. It has a thumb screw adjustment. Holding spindles and nuts are copper plated to prevent damage from welding spatter. When closed, the clamp automatically locks into position until manually released.

Kennametal File Cuts Steels To Hardness of Rockwell 62C

A file which will cut steels of a hardness up to Rockwell 62C is being offered by Kennametal Inc., 103 Lloyd Ave., Latrobe, Pa. This file is called the F76 and is 11 in. long, ¾ in. wide and ⅜ in. thick, with a filing surface 4 in. long, made of grade K4H Kennametal, single cut with teeth at 30 deg. shear angle, 40 per in. Convenient grips are provided for handling.

Kennametal file

Service trials have demonstrated that this file will permit filing speeds of three to ten times those possible with another type of file, according to the maker. High carbon, high chromium steels have been filed at 800 surface ft. per min. and file life has been extremely satisfactory.

Du Bois Lubricoolant Material Provides High Working Speeds

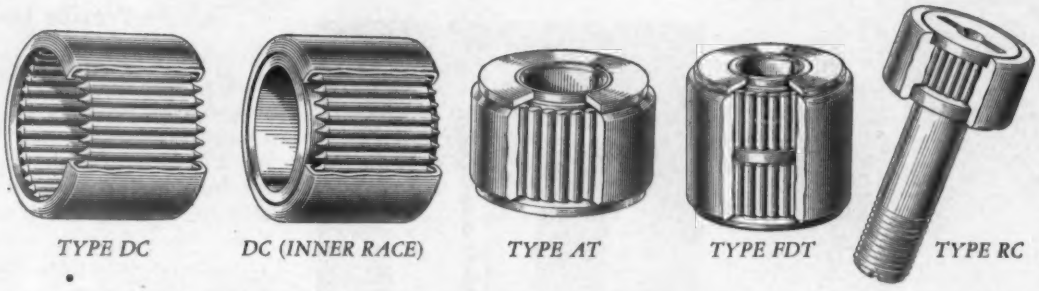
Lubricoolant, which is being manufactured by Du Bois Co., 1120 West Front St., Cincinnati 3, Ohio, is said to prolong tool life from 12 to more than 60 percent on metals all the way from chrome-molybdenum steel to aluminum alloys. Elimination of "dry welding" of chips to the cutting edge of the tool is said to be achieved also.

This material is transparent, and according to the producer it is free from objectionable odors and aids in eliminating dermatitis. High working speeds are possible with Lubricoolant.

Ross Midget Air Control Valve Is a Four-Way, Heavy-Duty Unit

Model 835 midget air control valve, which can be operated at sustained speeds up to as high as 400 reversals per min., has been designed by Ross Operating Valve Co., 6489 Epworth Blvd., Detroit 10, Mich. This valve is a ¼ in. heavy-duty, solenoid operated, four-way unit for the control of

These Needle Bearings ALL Have High Unit Capacity!



TYPE DC *DC (INNER RACE)* *TYPE AT* *TYPE FDT* *TYPE RC*

HIGH LOAD RATING IN PROPORTION TO SIZE AND WEIGHT IS IMPORTANT DESIGN FEATURE

As new applications have developed requiring a small size, lightweight, high capacity, anti-friction bearing, modifications have been made in the original Torrington Needle Bearing design until today a full line with a wide range of types and sizes is available.

All of these Needle Bearings offer the outstanding advantage of high unit capacity.

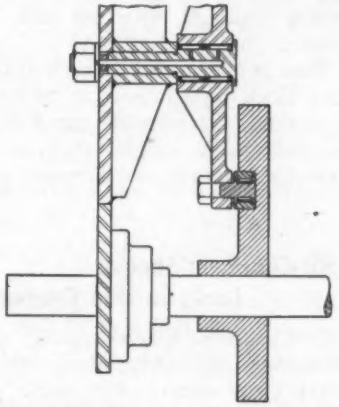
Their high radial load-carrying capacity is due to their basic design principle: A full complement of small diameter needle rollers held within a retaining raceway to form a single compact unit. Thus, in small space, more than double the "line contact" is provided than in other radial roller bearing types.

Weight distribution within the bearing's "load zone" is spread over a larger "area" and danger of stress concentration on races or rollers is consequently reduced.

"Heavy Duty" Types

Many of the newer types of Torrington Needle Bearings have been designed to utilize the full non-Brinell capacity available. For example, the FT Type is provided with a permanently attached inner race, hardened to a depth to carry the rated load of the bearing. The outer race is heavier and designed to serve without an auxiliary housing if desired.

Similarly, other RC Types for use primarily in the application of Needle Bearings as cam followers, have a heavy outer raceway and are designed for heavy rolling loads. Maximum static non-Brinell capacities extend from 1,410 to 133,600 pounds which provide the design engineer with a wide range in bearing selection. The Torrington Engineering Department should be consulted for capacity under rolling loads. Additional information will be found in our Catalog No. 105 available on request.



Application of the Type RC Needle Bearing in cam follower service and two DC Needle Bearings on rocker shaft are shown in this cross-section of a package sealing machine.

A Unique Combination of Advantages

All types of Torrington Needle Bearings offer the same outstanding advantages which gave the original unit such immediate and widespread acceptance. In addition to high capacity, they are small in size, light in weight. Their unit construction adapts them to mass production methods of assembly. They are easily and efficiently lubricated. And they are low in cost.

All these features are important in planning designs for today's needs and for "Tomorrow's" demands when reduced size, weight and cost will be important factors in contributing to increased production, distribution *and* operating efficiency. Our engineering staff will gladly work with you in selecting the Needle Bearing and in laying out applications.

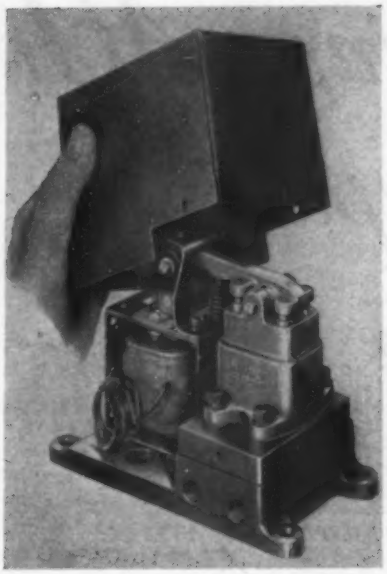
THE TORRINGTON COMPANY

Established 1866 • Torrington, Conn. • South Bend 21, Ind.

"Makers of Needle Bearings and Needle Bearing Rollers"

New York Boston Philadelphia
Detroit Cleveland Seattle
San Francisco Chicago Los Angeles
Toronto London, England

TORRINGTON
NEEDLE BEARINGS



Ross midget air control valve

double-acting cylinders. It may be used also as a three-way valve by plugging one outlet. Overall dimensions of the midget valve are 7× 3½×5¼ in.

Goodrich Industrial Clothing Has Synthetic Rubber Coating

Industrial clothing coated with rubber, synthetic rubber or other synthetic materials has been added to line made by B. F. Goodrich Co, Akron, Ohio. Included in the assortment are general purpose work coats, industrial coats and worker's leggings, work jackets, pants and hats.

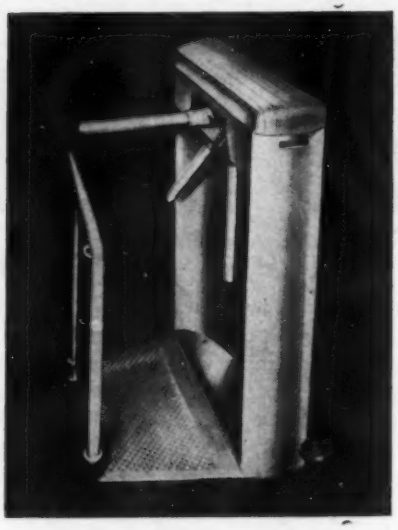
Burling Model H Limit Switch Equipped With Reset Button

Model H improved type temperature limit switch is offerd by Burling Instrument Co., 253 Springfield Ave., Newark, N. J., with switch normally closed for cutting off heat, stopping fan, closing valve-with switch normally open for lighting a lamp or ringing bell-with single pole double throw switch. This switch has a range of 0 to 1,400 F., and adjustable range of 200 to 300 F. Measurements are 5⅛×1¾×3 in.

It breaks the heating circuit while closing the alarm circuit. The reset button operates from outside of the case. Among the features of this limit switch are a dial pointer for easy setting, a locking screw which locks the tmperature setting and terminal plate with large screw terminals.

Perey Turnstile for Plants Counts Two Way Gate Traffic

A turnstile for plant entrance, which automatically counts employees as they pass in or out through the entrance, is being offered by Perey Turnstile Co., 101 Park Ave., New York 17, N. Y. The turnstile has two registers, one which operates



Perey two-way turnstile

in the entering direction and the other in the exit direction.

This unit provides a check against time clock registrations in and out. If desired, the turnstile can also be supplied with single registers to count personnel in one direction only.

Allis-Chalmers Sheave Locks in One Operation

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has designed the Magic-Grip sheave for quick and easy mounting and demounting. It locks to the shaft in one tightening operation.

This sheave is mounted by simply sliding it to exact position where it

Magic-Grip sheave

lines up with the sheave, and is tightened in place by inserting three capscrews. It is said that the design of the Magic-Grip permits the sheave to be mounted closer to the motor, with a resultant increase in bearing life.

Micronil Treatment for Gages Said to Provide Longer Wear

Protective Coatings, Inc., 10391 Northlawn, Detroit, Mich., has introduced Micronil for gage treatment to provide longer wear. It is applicable to all metals, and is suited for treating precision dies, punches, also for tapping and lapping operations. Micronil is a liquid which is applied by brushing a small amount to the leading edge.

In many cases, it is claimed, gage life has been doubled through the use of Micronil.

Ruthman Gusher Coolant Pump Is Propelled by a V-Belt

Ruthman Machinery Co., 1818 Reading Rd., Cincinnati 2, Ohio, has available a belt-driven Gusher coolant pump known as Model 1-P3. This unit operates in a vertical position and is propelled by a No. A V-belt using a detached motor or drive shaft.

A one-piece shaft is employed which revolves on two ball bearings

Ruthman belt driven Gusher pump

mounted within the tubular section between the plate flange and the V pulley. The pump stem, flange and impeller housing are interchangeable with and available in two lengths similar to Model 1-P3 motor-driven Gusher pump.

. . . and then the "TOMAHAWKS" came a-flying

YOU'VE READ many stories about how the Tomahawks licked the ME-110s, the Focke-Wulff 190s and Tojo's Zeros. But the chances are you've never heard how **"TOMAHAWKS"** helped to win one of the war's biggest battles.

These Tomahawks were not the Curtiss fighter planes known to every schoolboy of the United Nations, but Genesee **"TOMAHAWK"** cutting tools which – on the production front–have helped to win our first big battle, the battle of production.

These Tomahawks have come a-flying by the thousands and tens of thousands out of Genesee's three plants in Michigan's little town of Fenton. They tackle the toughest babies in the way of steels and bronzes and aluminum. Their pilots have not always been experienced–but these **"TOMAHAWKS"** like their flying namesakes have kept on and are keeping on cutting away, day after day and week after week–as part and parcel of the greatest production offensive success the world has ever known.

There is another battle Genesee has been helping to fight: The War on Waste. Its poster series–free to metal working plants in war industry – has been teaching workers the importance of conserving the vital materials used in cutting tools.

GENESEE TOOL COMPANY

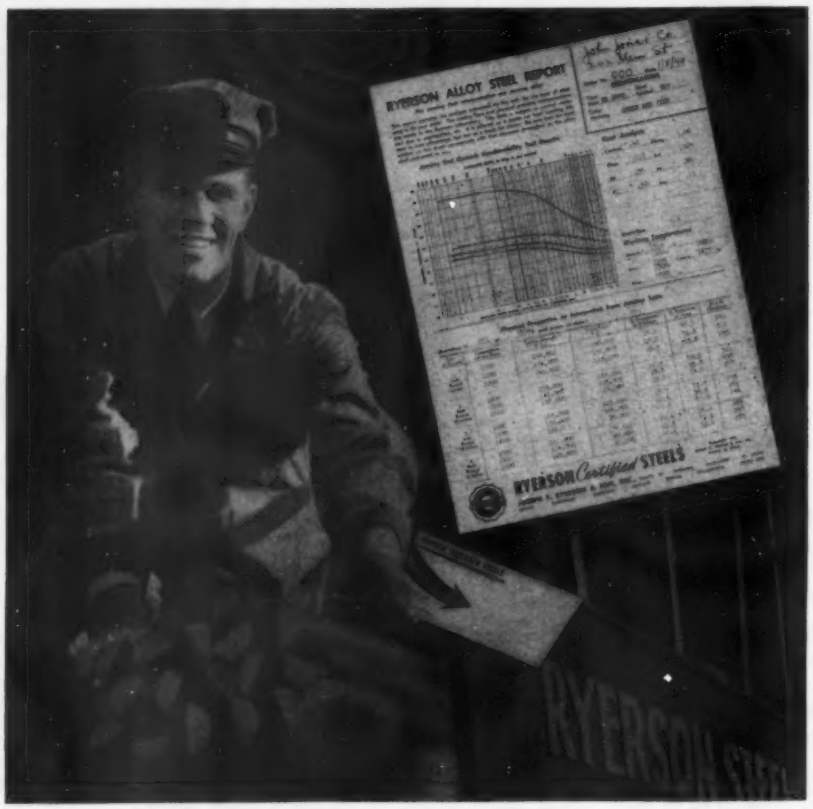
FENTON, MICHIGAN

Warehouse Service Keeps Pace With Wartime Developments in Alloys

The steel warehouses of the nation are charged with the responsibility of serving thousands of steel customers great and small. Any advancement in steel metallurgy becomes a problem or an opportunity for the warehouses. The advent of NE (National Emergency) Alloys, for instance, introduced new methods of evaluating alloy steels. Alloys may be accepted on the basis of their performance . . . rather than on the basis of analysis alone.

As the leading steel warehouse organization, Joseph T. Ryerson & Son, Inc., have contributed to the general acceptance of the new alloy steels and have been responsible in a large measure for the success of the program.

Among other features, this firm has inaugurated a new service for their alloy steel customers. The service embraces not only quality controls in the selection of steel for stocks, but, in addition, complete data is furnished on the heat treatment response for each lot of alloy steel shipped. This service is proving of real value to alloy steel users, who now can proceed with their heat treatment without worry about results.



New Data with Alloy Shipments

Time and money saving information is included on Ryerson Alloy Steel Reports furnished with each shipment of alloys. This report sheet gives you more complete data than has ever before been furnished with steel shipped from stock. A separate report is supplied for each heat and all heats are easily identified through color markings and heat symbols.

From large and complete stocks at Ryerson you can select the alloy steel best suited to your needs. Call your nearby Ryerson plant for quick action on alloys — or any other kind of steel you require.

Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON

TRADE PUBLICATIONS

ABRASIVES A second basic information booklet on Coated Abrasives has been issued by Behr-Manning, Troy, N. Y. In addition to discussing coated abrasives, their component parts, the manufacture and their ultimate use, there is included information on how to identify, how to order and how to store sandpaper.

ALLOYS Catalog No. 75 issued by Wall-Colmonoy Corp., 720 Fisher Building, Detroit 2, Mich., describes and illustrates uses of that firm's line of hard facing alloys and overlay metals.

BALL BEARING SERVICE A booklet entitled "Service Procedure for Ball Bearings" (ND-A57) has been prepared by the New Departure Division, Bristol, Conn. It gives in simple terms all of the steps from dismounting, cleaning, judging condition and remounting.

BELT TENSION A 70-page handbook published by Dept. 129, The American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa., explains the belt tension control feature of American Econ-o-matic drives and gives complete V-belt and flat-belt drive selection tables, specifications and installation instructions.

BRASS A 20-page book prepared by Manufacturers Brass Foundry Co., 7756 Dante Ave., Chicago, 19, Ill., takes the reader on a personally conducted tour of its new plant.

BRAZING ALLOY Handy & Harman, 82 Fulton St., New York 7, N.Y., has published a folder, No. 24, covering the use of Easy-Flo brazing alloy in the production of guns.

CARBON AND GRAPHITE Catalog Section M-8000 of Carbon Products Div., National Carbon Co., P. O. Box 6087, Cleveland 1, Ohio, covers the industrial applications of National and Karbate carbon and graphite products.

CHILLING Deepfreeze Div., Motor Products Corp., N. Chicago, Ill., offers a data book dealing with typical applications of industrial chilling machines for shrinking, hardening, testing and stabilizing metals.

CLEANING Magnus Chemical Co., Garwood, N. J., has issued an illustrated metal cleaning handbook which it describes as a technical manual on materials, methods and machines for wartime metal cleaning.

CLUTCHES The Hilliard Corp., 102 West Fourth St., Elmira, N. Y., has prepared a series of 4-page bulletins in the form of catalog sections relating to its line of friction, centrifugal, single and over-running clutches.

DECIMAL EQUIVALENT CHART Dayton Rogers Manufacturing Co., 2835 12th Ave. South, Minneapolis 7, Minn., has available two sizes of decimal equivalent chart calendars, 7 x 15 in. and 13 x 27 in. Requests must be made on company letterhead.

DOALL PRODUCTS Catalog No. 102 of Doall Service Co., Des Plaines, Ill., describes and pictures its line of sawing and filing machines and accessories, cutting lubricants and coolant oils, speed controls, precision measurements and industrial training facilities.

DRESSERS Hanchett Manufacturing Co., Big Rapids, Mich., has issued Bulletin 444-1 picturing, describing and pricing its wheel dressers for surface and other grinding machines.

DRILLING AND MILLING Davis and Thompson Co., 6619 W. Mitchell St., Milwaukee, Wis., offers a brochure picturing and describing the drilling and milling machines it manufactures.

GAS REGULATORS Victor Equipment Co., 844-54 Folson St., San Francisco, Calif., has published a bulletin describing and illustrating, with photos and cut-away drawings its various Gas-O-Dome regulators for inlet and delivery pressures "higher than can be handled adequately with spring-loaded diaphragm regulators."

GENERATORS AND EXCITERS Types B and CD 3/4 to 75kw., 2 or 4 poles, 125 or 250 v., 40 c. continuous shunt- or compound-wound direct-current generators and exciters are described and pictured in bulletin GEA-1607D, published by General Electric, Schenectady, N. Y.

GRINDERS Sav-Way Industries, 4875 E. Eight Mile Rd., Detroit, Mich., offers a broadside describing, picturing and giving specifications of its model M-H-2 internal grinder.

HEALTH Dunn Products, 329 S. Wood St., Chicago 12, Ill., has issued a 26-page catalog describing the various items it offers contributing to employee health and safety.

HEAT TREATING A revised 32-page booklet issued by The Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland 1, Ohio, describes the TOCCO process, illustrates typical applications and materials so treated and explains its advantages.

ISOTHERMAL TRANSFORMATION Fifty-six diagrams, so-called "S-curves," have been brought together in the new Atlas of Isothermal Transformation Diagrams published by the United States Steel Corp., New York. Each represents the time of response of a particular steel to specified con-

WORK BENCHES... NOT PARK BENCHES

Last year about 700,000 men came back from the armed forces. This year it is estimated that there will be over 1,200,000.

These men will have to be classified, tested and trained. Some who are partially disabled will need special help. All will need some sort of work. That is a promise Uncle Sam has made to these boys.

Your first thought is going to be, "With the cutbacks we'll get, and our reconversion problems, our plant can't possibly re-employ many of these men." You'll be absolutely right. Right here is where we need some new terminology in our economic setup.

In my opinion, "Industry" should be defined as that portion of our economic system that creates and produces. This takes in factories, farms and mines. The word "Business" should include that portion that has to do with transporting, selling, distributing and servicing the merchandise and goods that are produced. It also includes the professions and communication.

Now, if we go into past history on that basis, we find that "Industry" has never accounted for more than approximately one-third of all of the gainfully employed people in the United States. "Business" has accounted for the other two-thirds.

Yet "Industry" will be blamed for any failure to solve the postwar employment situation. Industry simply cannot sit back and let someone else try to figure out the solution.

The job is too big for Government. Even with the best intentions in the world, Uncle Sam, sitting in Washington, doesn't know your community. This is a community job. And if it isn't done right—*you'll* be blamed for it.

Geo. D. Trundle Jr.
President

1919-1944

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This Booklet entitled, "How To Make Your Standards Last Longer," will give you some valuable information on the proper care of gage blocks. Please write on your company stationery giving your title or position, and this booklet will be sent to you.

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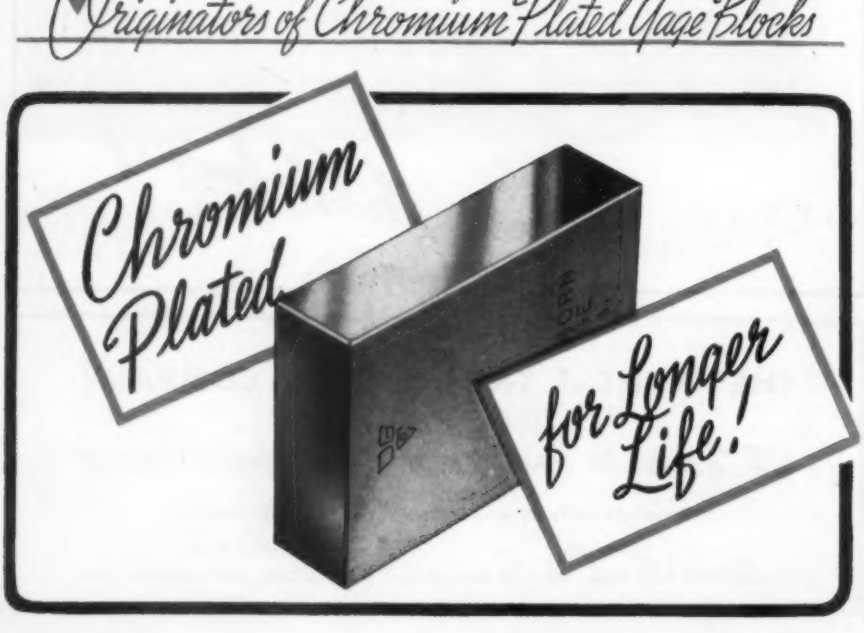

ditions of temperature and therefore serves as a map to guide the practical man to the proper heat treatment of each of these steels.

INSTRUMENTS George Scheer Co., 128 Lafayette St., New York, N. Y., has published a bulletin describing its 1-, 2- and 3-in. Reed micrometers with vernier readings to ten-thousandths of an inch.

JOB RELATIONS Walker-Turner Co., 639 South Ave., Plainfield, N. J., has published for issuance to its employees a pocket-size booklet designed to explain rules and regulations, and various other aspects of connection with that firm.

LATHES AND GRINDERS Bulletin No. 500A of the Rivett Lathe & Grinder Inc., Brighton, Boston, Mass., is devoted to its line of tool room and bench lathes, hand screw machines and internal grinders.

LIGHTING Westinghouse Lamp Division, Bloomfield, N. J., has issued a 175-page "Lighting Handbook," designed as a practical guide and working reference book for lighting engineers, designers, architects and builders. $1.00

LOCOMOTIVES "Porter Steam Locomotives," a new catalog giving technical data on its line of industrial and switching locomotives, has been announced by H. K. Porter Co., Pittsburgh, Pa.

LUBRICANTS Literature prepared by The DuBois Co., Cincinnati, Ohio, describes Lubricoolant, which "takes the place of conventional 'cutting oils' on all metals from aluminum to molybdenum steel."

MANAGEMENT Pioneer Engineering & Mfg. Co., Detroit 3, Mich., has released a brochure titled "Solutions to Some Executive Problems," which describes that firm's services as management and production consultants.

MANGANESE STEEL American Manganese Steel Div., American Brake Shoe Co., Chicago Heights, Ill., has published bulletins 943 and 1043-CM. The first is devoted to the advantages and uses of manganese steel from the standpoint of the railroad industry; the second from that of cement mill equipment.

MATERIAL HANDLING Revolvator Co., North Bergen, N. J., has published a broadside on "The Art of Piling for Modern Industry." In it are illustrated many different applications of Revolvator portable elevators.

METAL CLEANING The Enthone Co., Dept. AM, 442 Elm St., New Haven, Conn., has published a bulletin describing its alkali steel cleaner called "Cleaner 100," designed for cleaning of steel by either immersion or electro-

lytic means. Another bulletin by the same company describes its "Acid Addition Agent" used in sulphuric, hydrochloric and other non-oxidizing pickles for better metal finishing.

MILLING MACHINES A catalog prepared by Jefferson Machine Tool Co., Fourth, Cutter and Sweeney Sts., Cincinnati, Ohio, describes and prices its motor driven Bulldog precision milling machines and attachments. Included, also, are conversion attachments for lathes, endless belt sanding machine, swing frame grinding and polishing machine and gyratory foundry riddle.

MOTOREDUCERS Falk Corp., 3001 W. Canal St., Milwaukee 8, Wis., has issued Bulletin No. 3100 which presents the methods of selection, selection tables and dimensions of the units made for three service classes of units made by the company in conformance with the A. G. M. A. Recommended Practice.

POLISHING James H. Rhodes & Co., 157 W. Hubbard St., Chicago 10, Ill., has issued a publication featuring its composite and inter-related line of industrial finishing mediums, including felt wheels and bobs, industrial felts, steel wool, powdered and lump pumice and abrasives and rouges. Another catalog by the same company gives a detailed outline of the proper way to set up a polishing wheel.

PORTABLE ELECTRIC TOOLS "How to Get the Most From Your Portable Electric Tools" is the title of a section of the catalog published by Skilsaw, Inc., 5033-43 Elston Ave., Chicago 30, Ill. This war-time maintenance manual is full of illustrations and valuable suggestions on care and operation of portable electric tools.

PRESSES The Federal Press Co., Elkhart, Ind., has prepared an illustrated brochure presenting its line of open-back inclinable presses. Specifications of each type are given.

PROPELLER SERVICE TOOLS Catalog "H," devoted to service tools for Hamilton Standard propellers has been issued and is available from Airplane Manufacturing & Supply Corp., Manufacturing Div., 6853 Lankershim Blvd., North Hollywood, Calif.

PUMPS A series of catalog inserts issued by Worthington Pump and Machinery Corp., Harrison, N. J., describe, illustrate and specify various Monobloc centrifugal pumps it produces: Bulletin W-321-B7C, open impeller, type DO, sizes 1½, 2, 2½; W-321-B13B, steam turbine drive types DY, DEY, DHY, DOY; W321-B14B, single stage, sizes 1 to 5; W-321-B15, two stage.

RIVETS Cherry Rivet Co., 231 Winston St., Los Angeles 13, Calif., offers a chart presenting the essential material on blind-riveting operations. Special feature is a scale reproduction

Photo — Courtesy Consolidated Vultee Aircraft Company

STANDARD CONVEYOR COMPANY is able, through long experience, to specify and build for a diversity of handling needs . . .

A procession of products, of the widest imaginable variety, is pouring off assembly lines today — on time, or ahead of schedule — because Standard Conveyors are helping to channel the flow of production. Whether the rate of manufacture is several hundreds a minute or one an hour, Standard builds the right type of conveying equipment to meet the situation.

The range and versatility of Standard Conveyor equipment is the result of nearly 40 years of close contact with inside-the-plant transportation — in plants large and small, making products as widely diverse as steel or cosmetics. The benefit of this experience is available to you, without obligation.

The counsel of Standard Conveyor engineers is valuable in deciding on the right kind of conveying equipment to "deliver the goods" faster—at lower cost — now or for postwar production. *Write for comprehensive reference book — "Conveyors by Standard"—Catalog No. AM-2.*

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Woody Spencer says:
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The Wood & Spencer Company
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of countersunk and brazier-head rivets that shows the proper rivet to be used in any thickness of material from 0.030 to 0.391 in.

RUST PREVENTION A 4-page bulletin issued by The Enthone Co., Dept. AM, 442 Elm St., New Haven, Conn., describes emulsion waxes available for use in applying rust-inhibiting films upon metal.

SAFETY A 12-minute motion picture, "The Magic Carpet," showing, and giving oral explanation, of good and bad housekeeping in industry, is about to be released by Department AM, Waverly Petroleum Products Co., Philadelphia, Pa.

SHARPENING A pocket-size, 16-page, -color, technical manual (Bulletin HT-43) compiled to enable faster, more accurate sharpening of thread-milling cutters, gear hobs, etc., has been made available by Detroit Tap and Tool Co., 8432 Butler Ave., Detroit 11, Mich.

SPRAY NOZZLES Worthington Pump and Machinery Corp, Harrison, N. J., has prepared bulletin W-404-B2, illustrating, specifying and describing spray nozzles for steel mills for descaling service in the manufacture of strip, plate and bar steel and forged products.

STEELS Jessop Steel Co., Washington, Pa., offers bulletin 443, pocket size, devoted to specifications of its line of 2-B hot work steels.

SUBSTATIONS "Packaging Pays Off" is the title of bulletin B6285 of the Allis-Chalmers Mfg. Co., Milwaukee 1, Wis., which describes standardized load center unit substations of 100 to 2000 kva capacity for meeting the power supply needs of all types of industry.

SURFACE FINISH ANALYZER Brush Development Co., 3315 Perkins Ave., Cleveland, Ohio, has published a pamphlet describing and picturing its surface analyzer and its direct inking oscillograph.

THREAD ROLLING Catalog No. 9 of Rolled Thread Die Co., 237 Chandler St., Worcester, Mass., is a thread rolling handbook treating of history and development, processes, the mechanics of flat die thread rolling, and describing that firm's thread rolling dies and machines.

TOOL HANDBOOK A 60-page special tool handbook that includes illustrations and mechanical drawings of high speed steel cutting tools has been released by the U. S. Tool & Mfg. Co., 6906 Kingsley, Dearborn, Mich.

UNIVERSAL JOINTS Bulletin CS-10 of Condenser Service and Engineering Co., 95 River St., Hoboken, N. J., depicts, with photographs and engineering drawings, and gives specifications

YOUR POSTWAR PLANNING

AND VICKERS HYDROMOTIVE CONTROLS

While postwar plans cannot now be precisely determined, it is clear that one need is for improved products to keep manufacturing at a high level and provide the work necessary to maintain the American standard of living.

After the war, business must be won against stiff competition in practically every field. Present models of many machines will be made obsolete by others with important improvements that cannot be ignored.

The exceptional versatility of Vickers Hydromotive Controls provides unusual opportunities to the machine designer . . . opportunities for far-reaching improvement in the important fields of better control—higher production rates—wider utility—greater safety—elimination of operational difficulties.

Your postwar planning is undoubtedly now underway. Vickers Application Engineers will welcome opportunities to cooperate with you.

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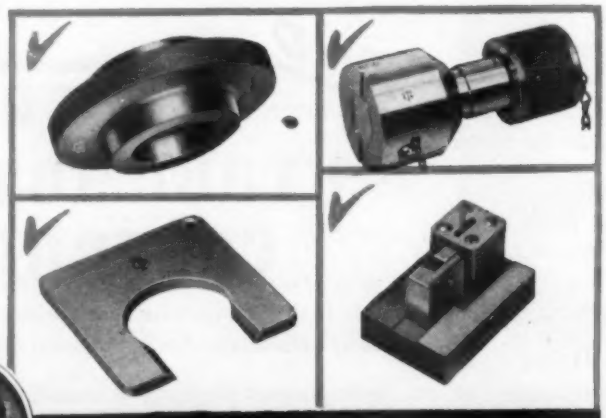
● Turner is making reasonably fast deliveries on their plug, ring, snap, flush pin and built up gauges. For up-to-the-minute delivery promises on these gauges write our sales department today. Remember to look for Turner's Stamp of Precision on the gauges you buy.



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Get all the facts about PLAST-O-LOCK GAUGES

● This three-color folder is just off the press. It tells you all about Turner's new Plast-O-Lock (pat. applied for) collet type gauge. This gauge is another first by the Turner Brothers in bringing to industry an improved type of standard plug gauge that will save you time and money in your inspection department.

of, its line of bevel gear universal joints.

VALVES Catalog No. 14-B of R-S Products Corp., Wayne Junction, Philadelphia 44, Pa., describes a complete line of butterfly valves for pressures from 15 to 900 psi. It contains detailed specifications, applications and descriptions of new type valves.

WAGE INCENTIVES Completion of a 48-page booklet on wage incentives in wartime, a guide to increased production without extra manpower, has been announced by Consolidated Management Consultants, 521 Fifth Ave., New York 17, N. Y.

WELDING A 233-page guide and reference book on maintenance arc welding has been published by The James F. Lincoln Arc Welding Foundation, Cleveland, Ohio. It comprises 25 of the most significant award papers in the 1940-42 Industrial Progress Award Program's maintenance classification.

WELDING A 16 mm. sound, color film, showing the fabrication of ship stern frames by the Thermit welding process, has recently been produced by Metal & Thermit Corp., 120 Broadway, New York, N. Y.

WIRE ROPE A buyers guide (No. G-15) available from Macwhyte Co., attention Mr. Jessel S. Whyte, president, Kenosha, Wis., contains information on conservation and care of wire rope, as well as tables and information in accordance with new simplified practice thereon. Also available from the same company is a compilation in pamphlet form of its wire rope conservation bulletins; it may be requested as No. 43-85. Each should be requested on company letterhead.

NEW BOOKS

FOREMANSHIP TRAINING—*By Capt. Richard B. Starr.* 191 *pages. Published by Prentice-Hall, Inc., 70 Fifth Avenue, New York, N. Y.* $2.65.

It is the supervisor who actually gets the work done. It is his responsibility to see that the plans of management are carried out, and that the workers under his direction actually make the products or their component parts. The foreman has direct control over that most important industrial asset, the men and women who do the productive work.

The vast expansion of industrial activity has resulted in the creation of thousands of new foremen and millions of new leadmen. The demands of the armed services have transferred many experienced supervisors and skilled workers from the

A Completely Equipped Foundry has been added to Brake Shoe's Research Group

Vital war work demanded a full-scale foundry for experimental castings.

Such castings might be piloted in a production plant, but this would interfere with regular work.

Today this full-scale experimental foundry is ready for operation as part of Brake Shoe's Research Group.

To house this foundry, an unused factory building had to be dismantled and moved from Kansas City, Kansas, to Mahwah, New Jersey.

If engineers can take new ideas in foundry practice direct to the foundry and get all the kinks out before going into regular production . . .

It should effect important time savings.

It should accelerate necessary field testing and develop improved methods.

In addition to current concentration on problems directly connected with wear, experienced metallurgists and engineers of this Research Group are constantly working to improve products and production methods.

If you have a "punished part" problem, either in the structural or production phase, Brake Shoe's expanded research facilities should be helpful. They are available to manufacturers whose production calls for large runs of standardized parts.

Is Brake Shoe On Your Parts Source List?

Because many of the millions of parts produced by Brake Shoe for war have equally important peacetime uses, Brake Shoe will be ready for parts assignments in volume, the moment victory is won.

American Brake Shoe Company, 230 Park Avenue, New York 17, New York

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2. Metallurgical Laboratory
3. Experimental Foundry

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American Manganese Steel Division, *Chicago Heights, Ill.*	Southern Wheel Division . . . . . *New York, N. Y.*
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. . . standard equipment with leading makers of steel mills, sugar mills, excavators, etc.

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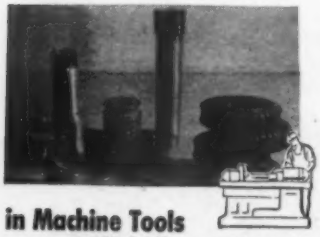

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Ampco's nation-wide field organization of metallurgical specialists is at your service — to help you with engineered applications of this superior alloy of the aluminum bronze class. Ampco's remarkable performance in war service is bringing home the outstanding value of this unique metal. Ampco Metal is constantly demonstrating its ability to "stand up and take it" under conditions where ordinary bronzes fail. Ampco's longer life in your service means the elimination of costly breakdowns. Ampco's broad facilities and wide experience enable you to utilize Ampco Metal in many forms. Regardless of what your bronze problem may be, *we can help you!*

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factory to the fighting front. The scarcity of manpower and the rise of labor legislation has transformed into a liability the old-timer who ran his department with an iron hand. Today supervisors must lead, rather than drive.

The ability to handle men and women successfully can be acquired through study, thought and experience. One method of study is the guided conference, whereby a skillful conference leader draws from an interested group of conferees information which they posses as a result of their own knowledge or experience. Captain Starr has compiled in his book a series of conferences on some of the most pressing problems which confront the foreman.

The men who prepared the material were all members of the original instructional force which, under the Engineering Defense Training program, began in 1940 to prepare Chicago industries for the war effort. They, and the editor, were the original instructors in Industrial Management for Foremen, a course given by the conference method to several thousand industrial supervisors in the Chicago area as part of the Engineering Defense Training and Engineering and Scientific Management Defense Training programs of Illinois Institute of Technology.

The book contains positive suggestions for the handling of the foreman's daily problems, and uses cases drawn from actual experience to illustrate the techniques which are developed in the conferences.

TO THE EDITOR

Would Speed Warehouse Deliveries

Dear Sir:

Claimant agency inspection of nonferrous metal at point of manufacture would save considerable time and eliminate the taking of chemical and physical tests at warehouses.

Warehouse purchases are speculative, and there is no way to predict, prior to receipt of material, exactly what will be its eventual use. The solution to the problem is simply the devising of some means whereby resident inspectors at the various mills would inspect and certify every shipment of material destined for a warehouse. Then, when orders are received, the warehouse could make immediate delivery without the delay of awaiting inspection.

Material purchased from warehouses is material that is urgently needed. Improvements in processes are of lessened value if the material to be processed is not available immediately when needed.

G. P. Oldham
New York Brass & Copper Company

Remember

...start with

THE RIGHT TOOL STEEL

for machining
Monel, Nickel, Inconel

TUNGSTEN high-speed tool steel (18-4-1 high-tungsten, low-vanadium type, with 0.70-0.75 per cent carbon content) is most satisfactory for general use in machining high-nickel materials.

Toughness, and ability to hold a cutting edge at moderately high-machining temperatures are characteristic of this tungsten steel.

It is easily formed into tools and is relatively insensitive to variation in heat treatment. The following procedure should be followed as closely as possible to obtain the necessary Rockwell "C" hardness of 63-66:

(1) Anneal at 1650° F. and furnace cool.
(2) Preheat slowly to about 1500°—1600° F.
(3) Transfer to high-heat furnace, bring up quickly to 2350°—2400° F.
(4) Quench in oil, or cool in dry air blast.
(5) Draw to 1050°—1800° F.

In machining high-nickel castings, many machinists prefer an 18-4-1 steel with cobalt and low molybdenum content.

To get the necessary Rockwell "C" hardness of 64-65:

(1) Preheat slowly to about 1500° F.
(2) Transfer to high-heat furnace and bring up quickly to 2425° F. Hold for a time, depending upon the size. *Do not soak.*
(3) Cool in dry air blast.
(4) Draw to 975° F.
(5) Redraw to 650° F. (to toughen).

Tools cooled in an air blast must be ground deeply to remove the decarburized surface. For tools exposed to severe shock, a hardness of Rockwell "C" 60 is preferred.

Carbon tool steels are not satisfactory for machining high-nickel materials. Stellite, tungsten carbide and tantalum carbide are suggested for cutting hard "K" Monel (over 275 BHN) and cast "S" Monel where the nature of the work and the condition of the machine permit.

For further information about Tool Steels, and other machining problems, write for booklet, "T-12—Machining."

USE THIS COUPON

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

Please send me ..... copies of the booklet, "T-12—Machining."

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Sheet . . . Strip . . . Rod . . . Tubing . . . Wire . . . Castings

has proved its worth

The standard material for many years, throughout a well defined range of uses, has been tungsten high-speed steel — dependable, uniform in behavior, little subject to scaling or distortion under heat treatment, marvellous for its contribution to the needful qualities of modern machine tools. It might have seemed that such a material, if it became scarce in wartime, would leave a fatal gap.

Tungsten has been scarce for many months. But so great has been the resourcefulness of our metallurgy and so fortunate our access to Molybdenum and other alternative materials, that American war production has gone on at a mighty pace.

Molybdenum high-speed steel, so called, did much to take the place of the familiar "18-4-1" tungsten-steel. Yet it did require some Tungsten, and it did necessitate changes in heat treating — often changes in furnace equipment.

With Tungsten again obtainable in increasing amounts, naturally some users are returning to their favorite of other days. Manufacturers of tool steels will gladly supply them.

Inquiries concerning any use of Tungsten, Boron, or Molybdenum will be welcomed by the Molybdenum Corporation.

AMERICAN Production, American Distribution, American Control—Completely Integrated.

Offices: Pittsburgh, New York, Chicago, Detroit, Los Angeles, San Francisco, Seattle.

Sales Representatives: Edgar L. Fink, Detroit; H. C. Donaldson & Co., Los Angeles, San Francisco, Seattle.

MOLYBDENUM CORPORATION OF AMERICA

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MCA

"Tools are Weapons —Treat 'em Right!"

Read these facts about tool supplies and restrictions

TOOL STEEL is a vital war material—so take good care of your drill bits, taps, files, chisels and other cutting tools. Take good care of your Black & Decker Electric Tools, too. They are the most widely used electric tools in war industry—demand still exceeds supply—and they are still subject to priority restrictions. BUT . . .

THERE ARE NO RESTRICTIONS on prompt, expert service—on repairs or replacement parts for Black & Decker Tools—through Black & Decker's 26 Factory Service Branches from coast-to-coast.★

THERE ARE NO RESTRICTIONS on many attachments and supplies that help you do more and better work with your Black & Decker Drills, Sanders, Grinders and other Portable Electric Tools.

THERE ARE NO RESTRICTIONS on our free booklet, "The Care and Maintenance of Portable Electric Tools." For a copy address: The Black & Decker Mfg. Co., 716 Penna. Ave., Towson-4, Md.

TOOLS FOR "PRIORITY" USES — the same versatile electric tools that later will help you swing back quickly to peacetime work—are available through your nearby Black & Decker Distributor.

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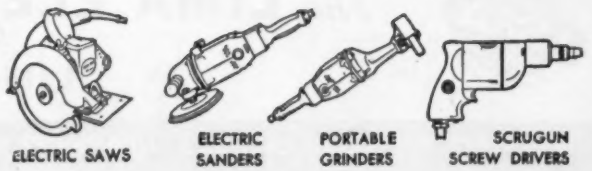

ELECTRIC SAWS — ELECTRIC SANDERS — PORTABLE GRINDERS — SCRUGUN SCREW DRIVERS

HIGH Speed or LOW Speed for ECONOMICAL POLISHING, BURRING.. or LAPPING.. OPERATIONS

Rapid, economical handling of ferrous metal parts in polishing, burring or lapping may require High or Low spindle speeds.

Lima Magnetic Polishing Lathes available with motors wound for single or two speed operation, in speeds to 3600 RPM. 2 or 3 phase as required. These dependable Lima Drip-Proof motors are of sturdy, ball-bearing construction, and insulated for long, trouble-free operation.

In addition to Multi-speed motors, the Lathes are equipped with the LIMA *"Step-Release"* foot pedal control giving added speed in handling work. This control not only starts and stops the motor, but also magnetizes and demagnetizes the chuck, allowing operator to use both hands to speedily place, process and remove the work. Multi-speed power, plus *"Step-Release"* control have won for LIMA the distinction of increasing production to 300%.

Available in Pedestal or Bench type, the Lathe offers many other features: Magnetic chuck, which holds parts from 7/8" diameter up; Interchangeable face plates and register plugs; Self-contained rectifier unit supplying DC current to chuck, and an adjustable, swinging table to hold work being processed. Entire unit is compact and easily accessible for inspection of all parts. *Wire or write for Engineering Bulletin.*

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1503 FINDLAY ROAD

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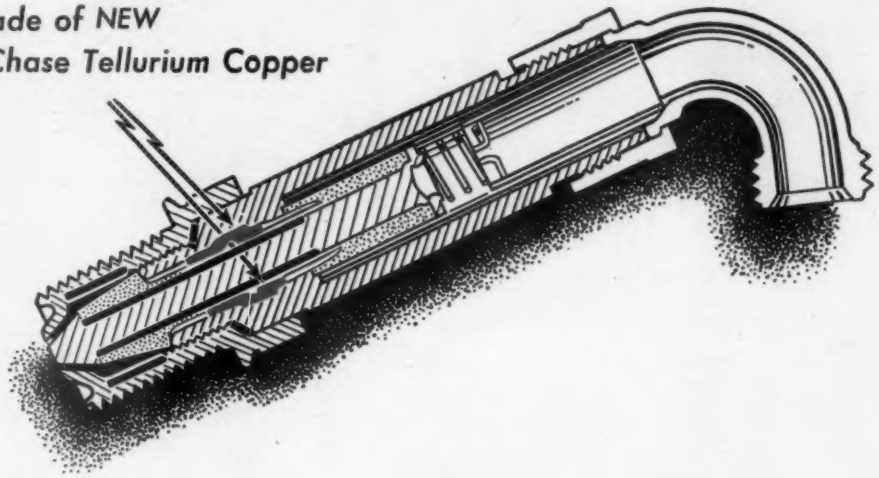
MAGNETIC POLISHING LATHES . . . GEARSHIFT DRIVES . . . PEDESTAL GRINDERS . . . ELECTRIC MOTORS

Heat-dissipating collar made of NEW Chase Tellurium Copper



Is there an idea for you in this aircraft spark plug?

If you are looking for a quick, sure way to select the *right* copper alloy for a particular job, there may be a tip for you here . . . whatever your product.

Do you need an alloy with unusual characteristics? You may find it among Chase's newer metallurgical developments. Chase Tellurium Copper, for example, used on the heat-dissipating collars of the Aero spark plug, combines exceptionally high thermal and electrical conductivity with excellent machining and forging characteristics.

Or is your problem largely one of time or cost economies in production? Cones, elbow cushions and shields on the spark plug are made of Chase Free Cutting Brass...long established as the most practical and economical alloy for general-purpose screw machine parts.

In the familiar fields in which there is no substitute for the copper alloys...in the newer applications opened by advances in copper metallurgy...count on Chase copper alloys to meet your needs. More important, count on the copper alloy specialists at the Chase Sales Service Office for assistance in selecting the alloy best suited for the requirements of your specific problem.

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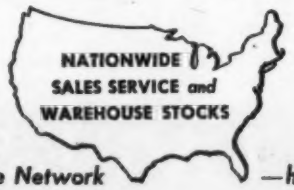

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MANY large users claim that the machinability of SHELBY Seamless Mechanical Tubing has lifted their production of precision parts out of the loss into the profit column.

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We furnish to users, every month, miles of steel tubing of various analyses, each one best fitted to do its intended job. Also, by special processing, we can supply SHELBY Steel Tubing for any customer's individual needs.

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It will pay you well, in savings of time and money, to keep fully informed on the latest developments of mechanical tubing for precision parts. Let us help you solve your machining problems. Write today.

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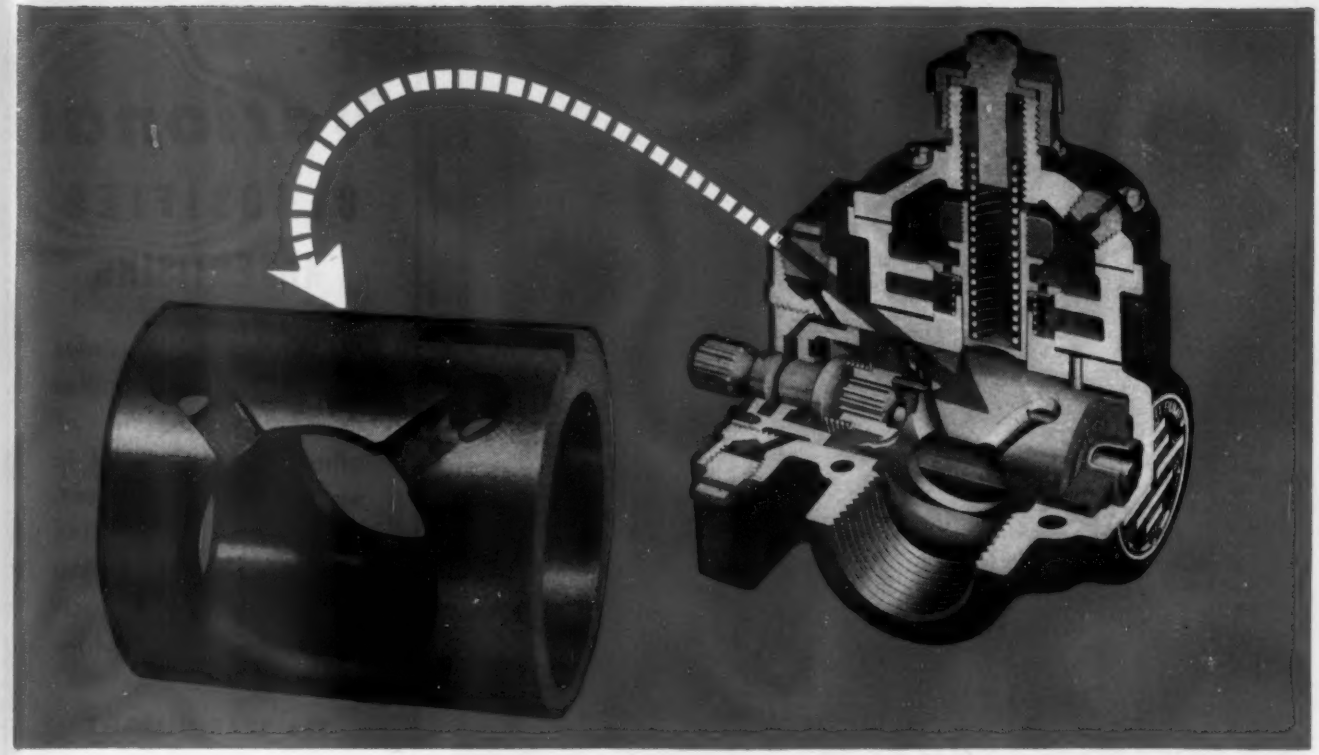

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An airplane fuel pump, manufactured by Pesco Products Co., Cleveland, Ohio, used to be made of nitri-cast iron. This metal had passed a 500-hour test pumping aviation gasoline.

For better results, Meehanite was tried—the special metal for castings that bridges the gap between cast iron and steel. The Meehanite sleeve . . . machined, water-quenched to average 52^{c} Rockwell hardness, then ground to finished dimensions . . . passed a 1200-hour test and earned an order for 2500 sleeves.

Probably you are continually running up against jobs that Meehanite castings could do better than other metals—because they are adaptable to heat treatment and flame hardening . . . can be machined at higher speeds and feeds . . . suffer fewer rejects (due to carefully regulated Meehanite foundry practice) . . . have greater tensile strength, often permitting reduction in section and weight. There are 21 types. For information, write the nearest Meehanite foundry.

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ONE STEEL *that gives you*

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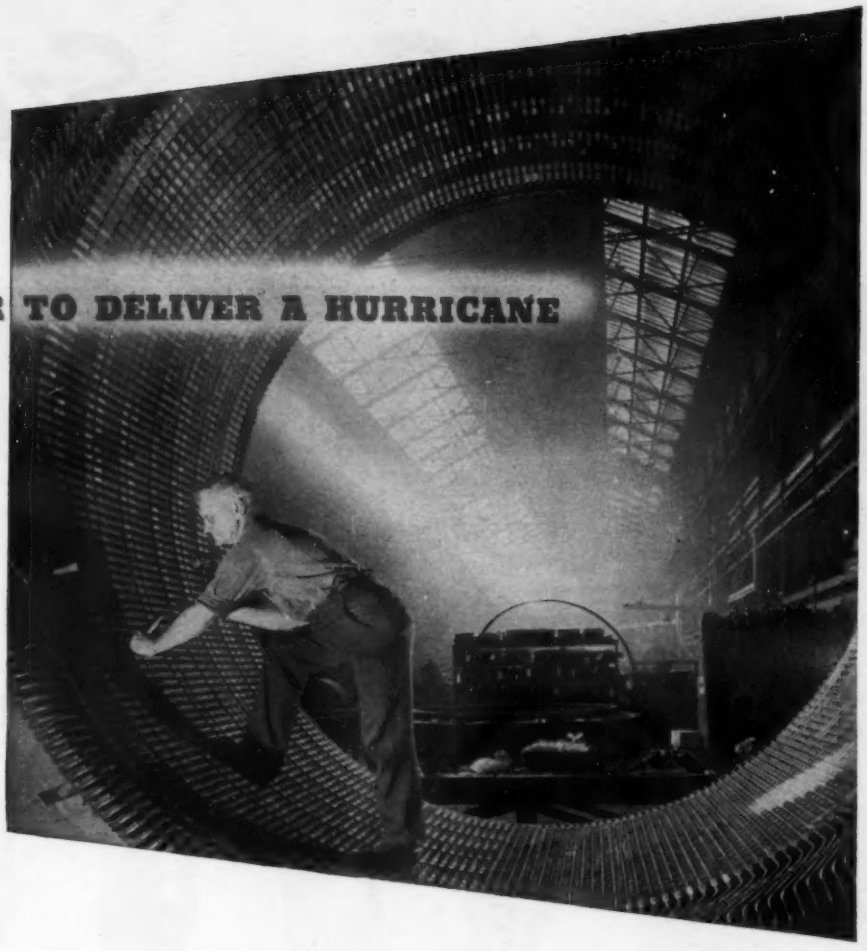
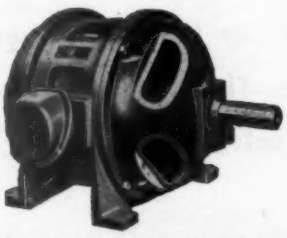
BUILDING A MOTOR TO DELIVER A HURRICANE



Driving a 400 mile-an-hour super-hurricane through a plane-testing tunnel takes plenty of horsepower . . . more than anybody had ever packed into a wound-rotor induction motor before. To do it, Westinghouse designed and built the world's largest. Its 40,000 horsepower spins two 16-blade fans standing nearly 40 feet high—weighing 197 tons. The motor itself weighs 125 tons, stands 15 feet high and you could drive a small truck through the stator you see above. Cooling it takes 85,000 cubic feet of air per minute.

This is just another example of Westinghouse ability to build motors—motors designed to do specific jobs. It's the kind of engineering skill back of every Westinghouse motor you buy—special or standard.

For war work or postwar reconversion, take full advantage of this ready-to-use experience. You'll solve your drive problem quicker and know the motor will fit the job—whether it is a fractional or 40,000 horsepower. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. J-21294

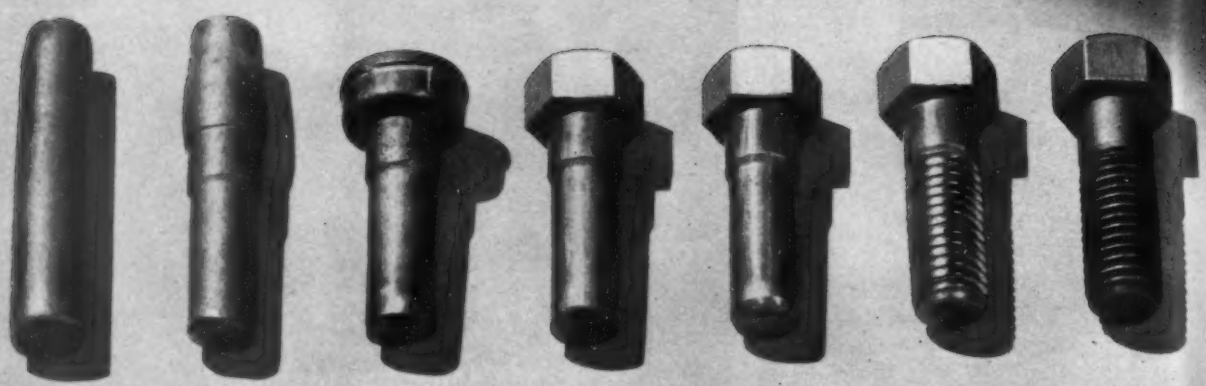


Westinghouse Motors

PLANTS IN 25 CITIES ... OFFICES EVERYWHERE

This is only one of the many Westinghouse general purpose motors available in standard and special enclosures. Features include choice of sealed sleeve or ball bearings; Tuffernell insulation; Balanced rotor; rigid one-piece frame; die-cast rotor; radio-frequency tested insulation.

Six Easy Steps . . . .



It takes only ONE SECOND to make this hexagon head bolt —which is representative of modern bolt manufacturing methods. If milled from hexagon bar stock it would take more than ONE MINUTE to produce.

When this bolt is finished, it is ready for heat treatment, represented by the *seventh step, above*. This last operation is necessary to attain prescribed physicals regardless of its method of manufacture.

IN MAKING A BOLT IN ONE SECOND..AS WE DO IT HERE AT LAMSON & SESSIONS . . .

● To make 100,000 ⅝″ x 2″ hexagon head bolts from bar stock we start with 48,700 lbs. of raw material. When we have produced 100,000 bolts, they weigh but 24,300 lbs. Our scrap loss is nearly 12½ tons of raw material or about 50%.

To make this hexagon head bolt from round wire on bolt-making machinery we start with 26,100 lbs. of raw material. When we have produced 100,000 bolts they also weigh but 24,300 lbs. Hardly 5% of material used becomes scrap!

The difference between the weight of raw material required for manufacture from hexagon bar stock and the weight of raw material required for manufacture from round wire is 22,600 lbs.—which is the amount of critical raw materials the bolt manufacturer avoided (1) buying, (2) stocking, (3) consuming, (4) converting to scrap, and (5) causing to be re-melted and re-fabricated!

It is important to realize that bolt manufacturers can make bolts by the upsetting or cold forging method from round wire up to ⅞-inch diameter, if they have the necessary equipment as does Lamson & Sessions.

If you need only a dozen bolts of a certain size or type you can afford to make them by milling from the hexagon bar—unless they are "standard" bolts of a size stocked by your jobber.

If you need (or think you need) a "special" bolt—before you make it yourself—find out if you really need the special design or size, or if you can adapt *your assembly design* to use existing "standard" bolt types and dimensions and materials—to save time and get as good a product. In most instances—we've found that you can!

If the information we offer you in our Lamson Blue Book, our standard catalog, isn't sufficient to answer your questions—write us or ask a representative to call before you decide upon a *special* bolt that would require *special* dies, *special* production methods and *special* inspections at every step in its manufacture. If you can use a "standard" product made from existing dies on bolt-making machinery, you have obtained the utmost efficiency—*and you've really "standardized."* Make it a rule for the duration—use a "standard" bolt whenever you possibly can.

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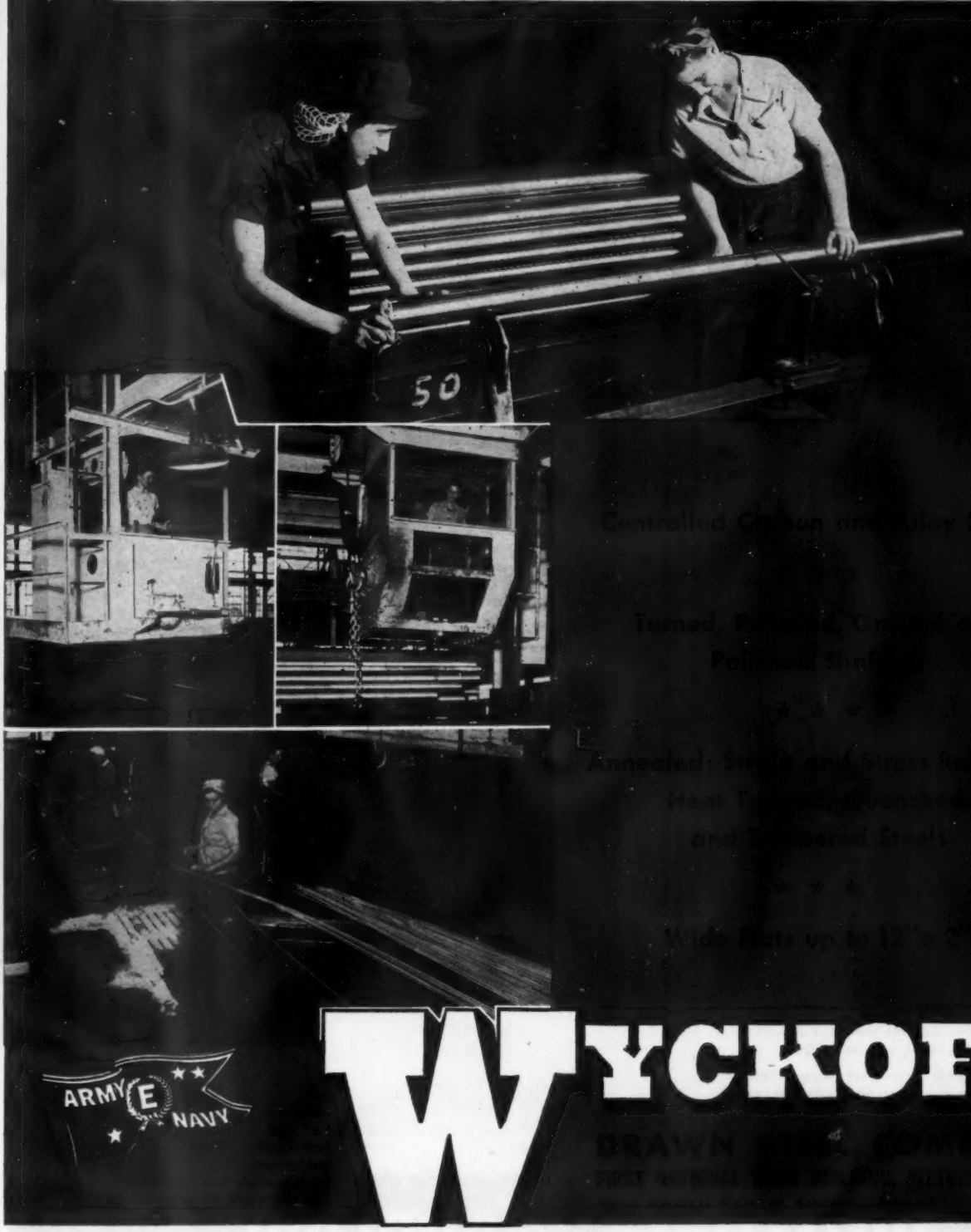

WYCKOFF

Only PHILLIPS Recessed Head Screws RATED OUR OKAY

...say 23 Leading Screw Manufacturers

FOR YEARS, leading screw makers tested ideas for recessed heads. All showed design faults. Then came the Phillips Recess. Unanimously, these makers agreed that here, at last, was the answer they'd been looking for . . . a scientifically engineered recess, *right* in every respect.

And practically the entire screw industry adopted it!

There's nothing exactly like the Phillips Recess. It's the only screw recess in which every angle, every dimension has a purpose—plays a definite part in screw driving efficiency and fastening strength.

That's why it pays to specify screws with Phillips Recessed Heads. You can get them in any head style, type, or size.

TO MAKE WARTIME QUOTAS AND PEACETIME PROFITS

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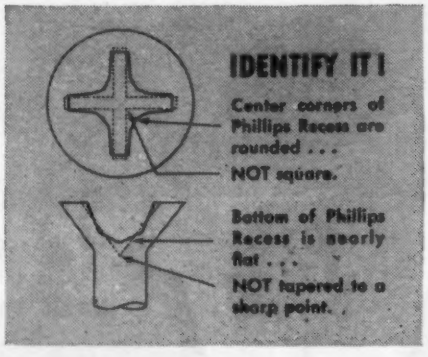
EASIER DRIVING: Turning power is fully utilized. Workers maintain speed without tiring.

BETTER FASTENING: Screws are set-up uniformly tight, without burring or breaking of screw heads. The job is stronger, and the ornamental recess adds to appearance.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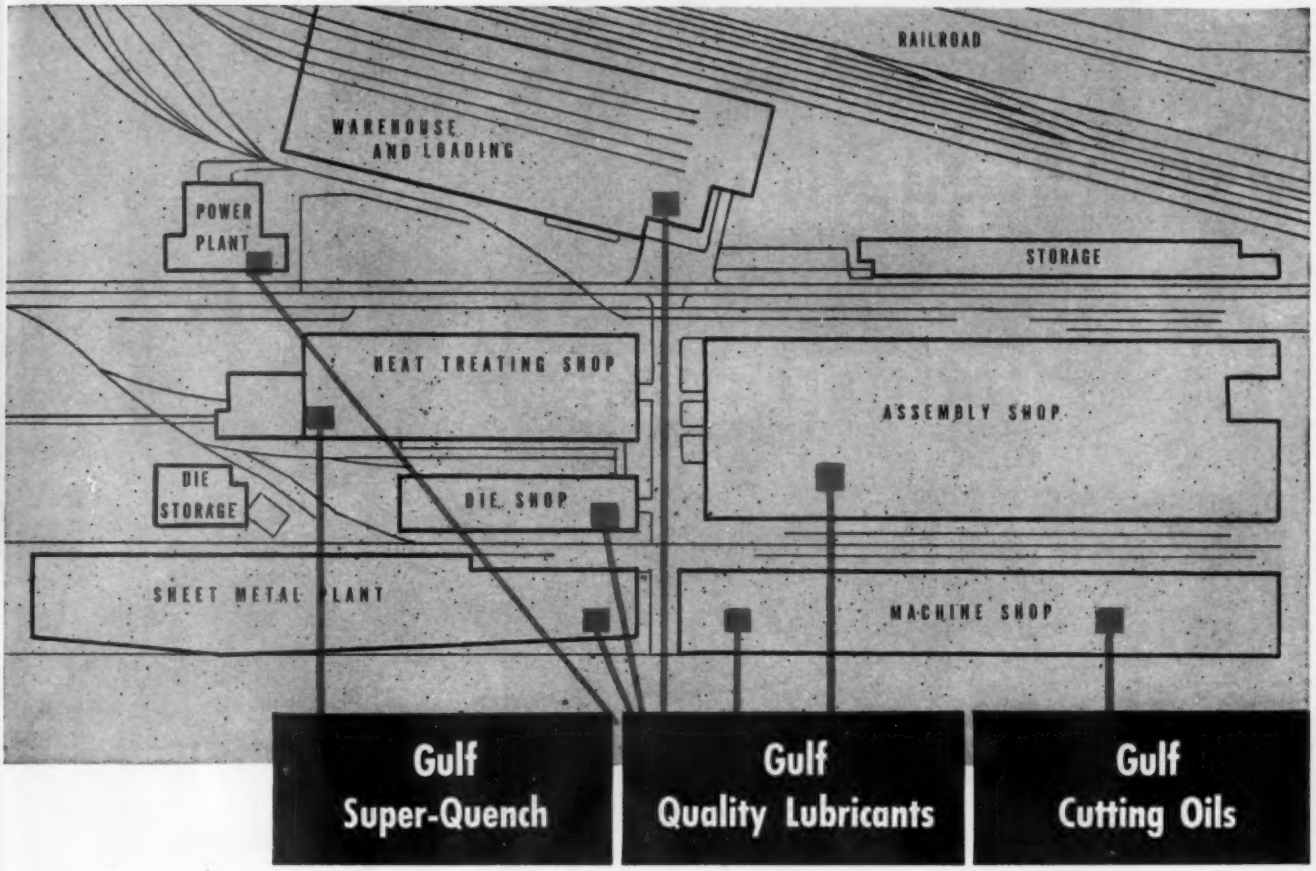

For every department in your plant, there's one or more Gulf quality petroleum products that can help you increase output and secure dollar savings.

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Gulf Super-Quench—A revolutionary new quenching oil that assures maximum oil-quenched physical properties in steel, with minimum distortion and cracking—makes many steel parts harder and stronger than has ever before been possible with oil quenching.

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Gulf Quality Lubricants provide an extra margin of protection against excessive wear and resulting mechanical troubles — help keep machines producing at top wartime speed and efficiency — are good production insurance.

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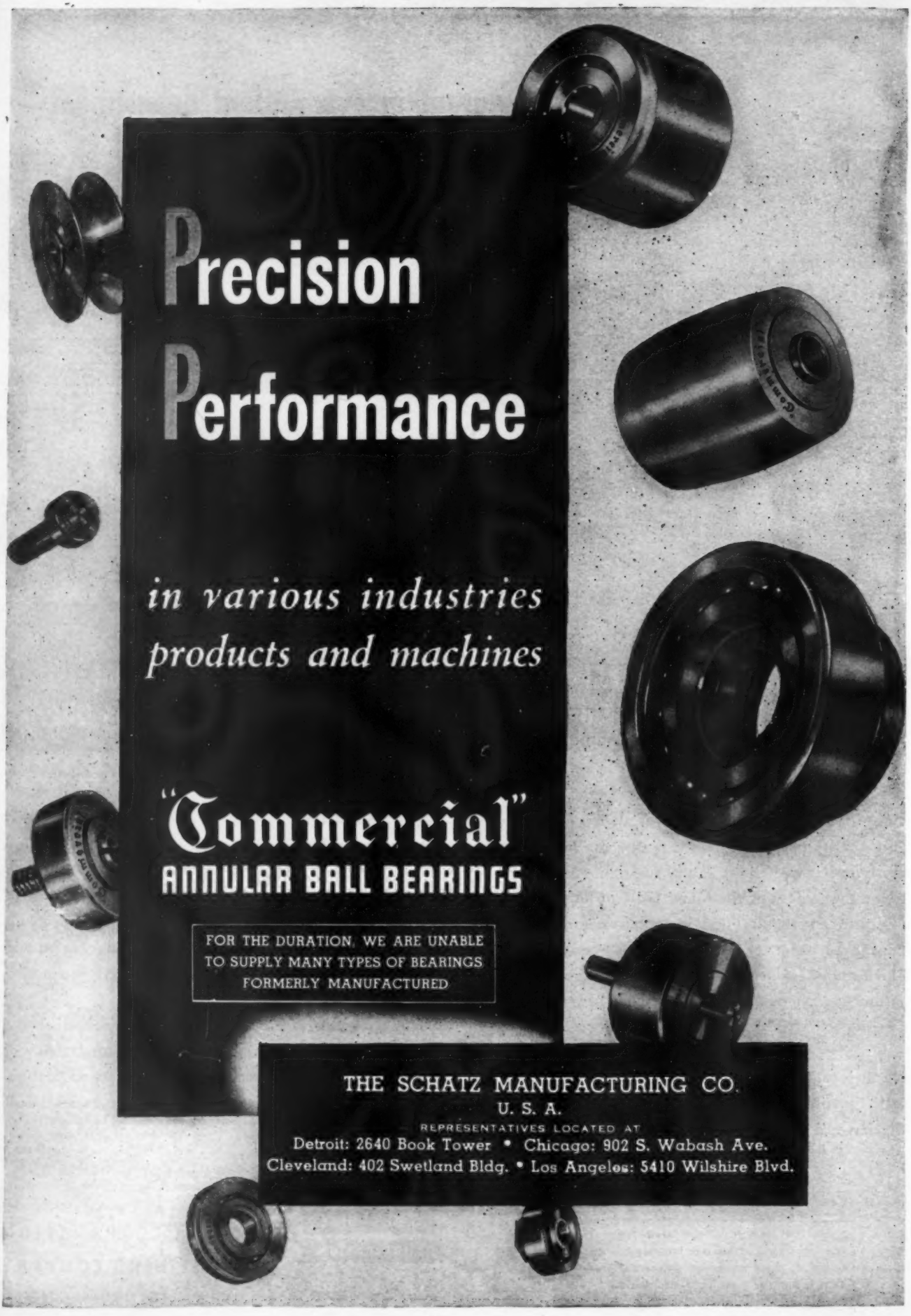
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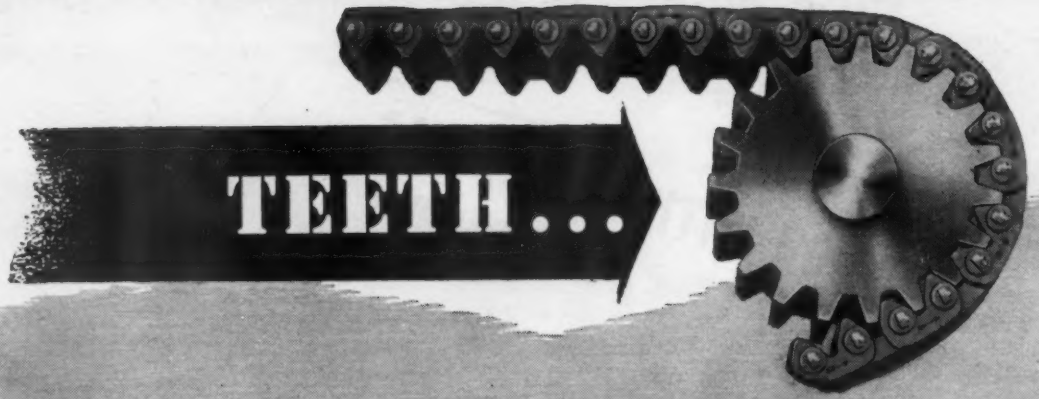

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Teeth Not Tension

ARE IMPORTANT

1 **Because they operate on the principle of "Teeth Not Tension" . . . Morse Chain Drives Cannot Slip, *Cannot Waste Power.***

2 **Because they maintain an absolutely constant speed ratio . . . Morse Chain Drives *assure full capacity machine production.***

3 **By transmitting an unvarying, constant flow of power . . . Morse Chain Drives *help work uniformity to be achieved.***

4 **Longer-lived, requiring no tensional adjustments . . . Morse Chain Drives reduce replacement and maintenance work, *reduce "Down" time.***

5 **Installed by slipping chain over pinions, inserting and securing the pin . . . Morse Chain Drives *eliminate the need for dismantling bearings or parts of the machine.***

6 **Unaffected by atmospheric conditions, idleness, or oil . . . Morse Chain Drives *operate at peak efficiency under all conditions.***

7 **Low in first cost and in maintenance cost, too . . . Morse Chain Drives *always cost less per year of efficient service.***

8 **Easily adapted to speed changes, capable of saving valuable space because they operate efficiently on short centers . . . Morse Chain Drives, from an over-all standpoint, *are most efficient, most economical.***

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Inventory Cut from 38,500 to 15,000 Tools In Three Months

in the Springfield Armory

TOOL INVENTORY SLASHED WITH McCASKEY CONTROL

"Controlling Tool Issue and Use, Springfield Armory, Springfield, Mass.", an article in a recent issue of Factory Management and Maintenance, outlines several steps taken to conserve tools and productive time. A few brief extracts contain valuable suggestions for other plants engaged in war work.

"Tool Control At the Armory consists of maintaining proper inventories, tool responsibility, and tool improvement. To obtain these factors, we make full use of a standard system of tool control altered slightly to meet our particular requirements.

"When this system was first installed, our total inventory was approximately 38,500 tools. After three months, this inventory had been reduced to 15,000 tools. Loss of productive time by personnel going from one department to another to find some particular tool also has been eliminated.

"The activity record gave us a yardstick by which we could measure the amount of work in each crib and on each shift, enabling us to employ our personnel to best advantage."

TOOL RESPONSIBILITY FIXED FOR THREE SHIFTS

"To obtain a tool, a man must make out a tool loan order form. Thus we know who has drawn the tool and who is responsible for it. The man who drew the tool knows he signed for it and is held responsible for it. He will see that it is returned to the crib. Our experience has definitely proved this statement.

"We do not necessarily have the man who drew the tool return it. Anyone may return it, but he must initial the pink copy. He then secures the original copy of the tool loan order slip and posts it in a clip on the machine. This enables the man who originally obtained the tool to destroy his own receipt, even though he may be on another shift. We find that the men working on the machine on each of the three shifts willingly cooperate with one another for mutual protection."

Space limitations prevent an account of how breakage has been reduced and "considerable information gained about problems in the shop that otherwise would have been secured only after a thorough investigation."

SENT FREE ON REQUEST

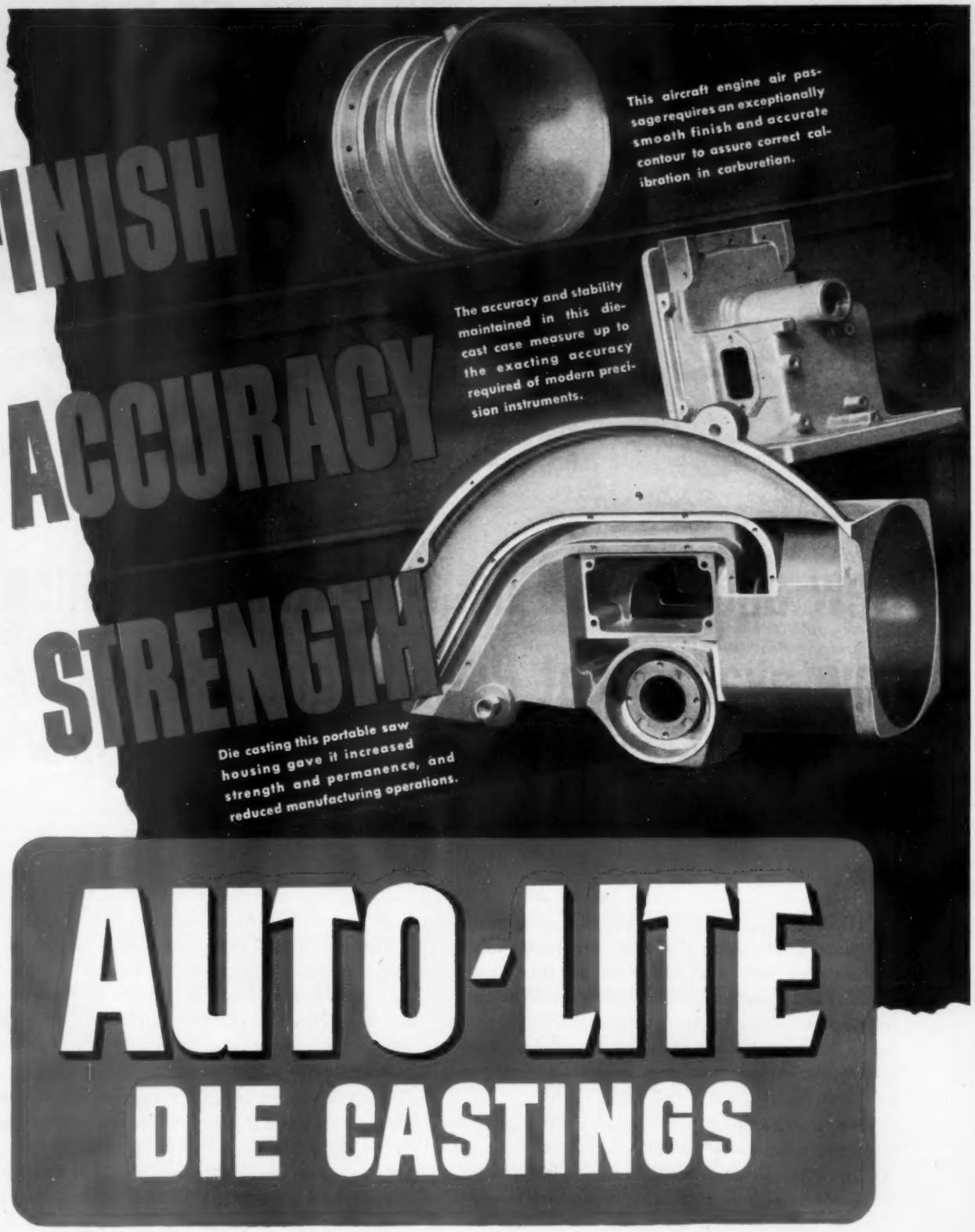
Reprint of complete article and similar reports of the experiences of several representative plants with McCaskey Tool Crib Control.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL


FINISH
ACCURACY
STRENGTH
This aircraft engine air passage requires an exceptionally smooth finish and accurate contour to assure correct calibration in carburetion.
The accuracy and stability maintained in this die-cast case measure up to the exacting accuracy required of modern precision instruments.
Die casting this portable saw housing gave it increased strength and permanence, and reduced manufacturing operations.

AUTO-LITE DIE CASTINGS

"Controlled Metals" give Auto-Lite Die Castings strength, accuracy and finish. Such thorough practice as spectographic analysis, metallographic studies, X-ray inspection and heat treating enables better control of metal for casting . . . avoids porosity . . . aids in elimination of defects through design change. Uniformity is maintained, for the complete run, once the desired standard is produced.

The Auto-Lite Die Casting plant combines under one roof complete facilities for die casting, machining and finishing either from zinc or aluminum. Auto-Lite's wide experience is available, within the limits of today's wartime demands, in adapting and producing die castings with the strength, accuracy and finish to meet your individual requirements. For information, write:

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THE ELECTRIC AUTO-LITE COMPANY

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Woodstock, Illinois

723 New Center Bldg., Detroit, 2, Michigan

To better serve steel users in the East.....

New and special heat-treating equipment now available at Pittsburgh...*has capacity to handle 25,000 tons of rolled alloy steel products annually*

THIS NEW HEAT-TREATING equipment places at the disposal of alloy steel users in the Eastern area the latest and most advanced mechanical and metallurgical developments in the fine art of annealing and heat treatment. It supplements the 158,400-ton annual capacity for producing electric furnace steel now in operation at our Duquesne Works, near Pittsburgh.

High, uniform quality is insured by a novel, 7-chamber, continuous furnace electrically heated and automatically controlled. It is used for production line service in heat treating bars which require quenching and drawing operations, normalizing or annealing, including special types of anneals such as sub-critical or by isothermal transformation.

So arranged that it may be operated in a continuous 366-ft. hardening and tempering line, this furnace will handle a *single layer* of 25-ft. bars, from ⅜ in. to 8¼ in. diameter, as well as flats or squares.

This method of single layer heat treatment of bars has definite advantages. Bars will be more uniformly heated, less scale is formed, overheating is avoided. Greater flexibility and closer control are also assured whenever a particular or special type of heat treatment is necessary.

For spheroidize annealing and for annealing operations requiring long controlled, slow-cooling cycles, three 25-ft. and two 36-ft. gas-fired car bottom furnaces are further available. Oil and water quench tanks are available for heat treating bars from these furnaces. The necessary auxiliary equipment is of the latest, most improved type.

Designed to insure superior physical properties in the heat-treated product, this equipment provides the flexibility to handle small orders as well as full heats when necessary.

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Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
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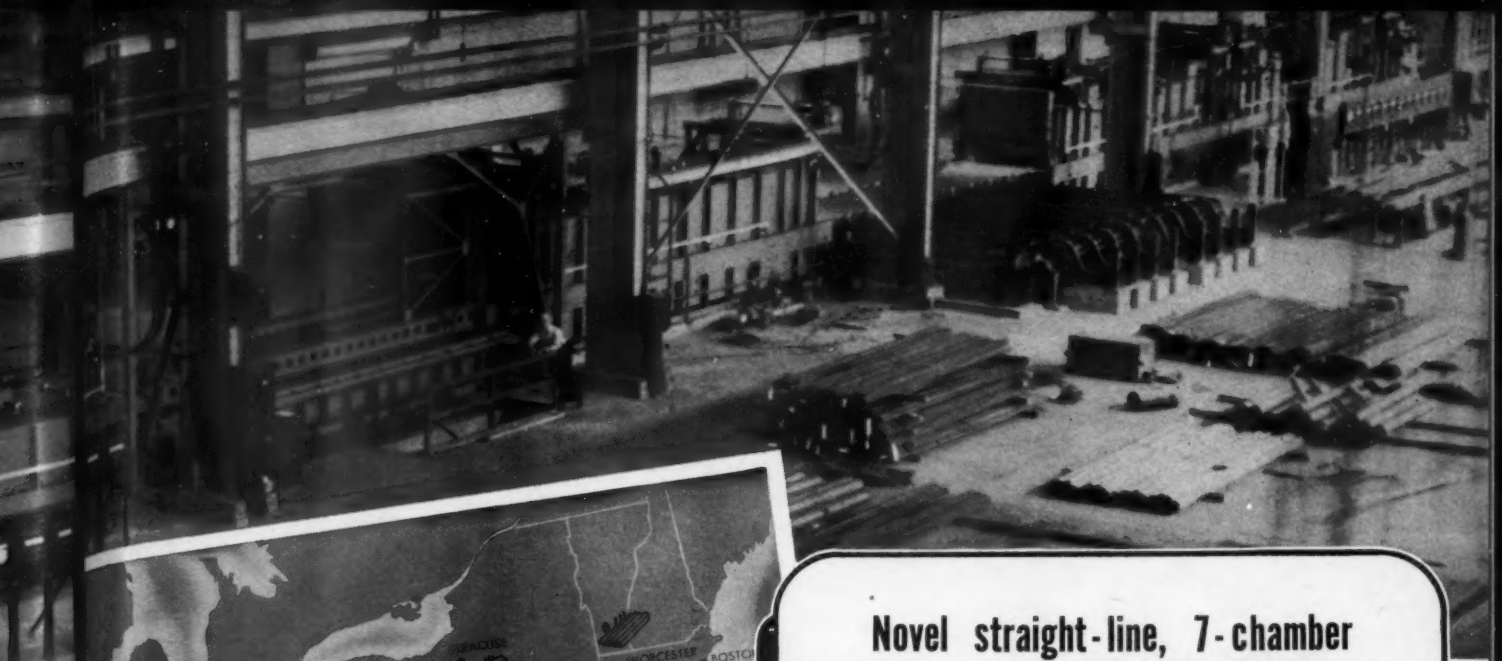


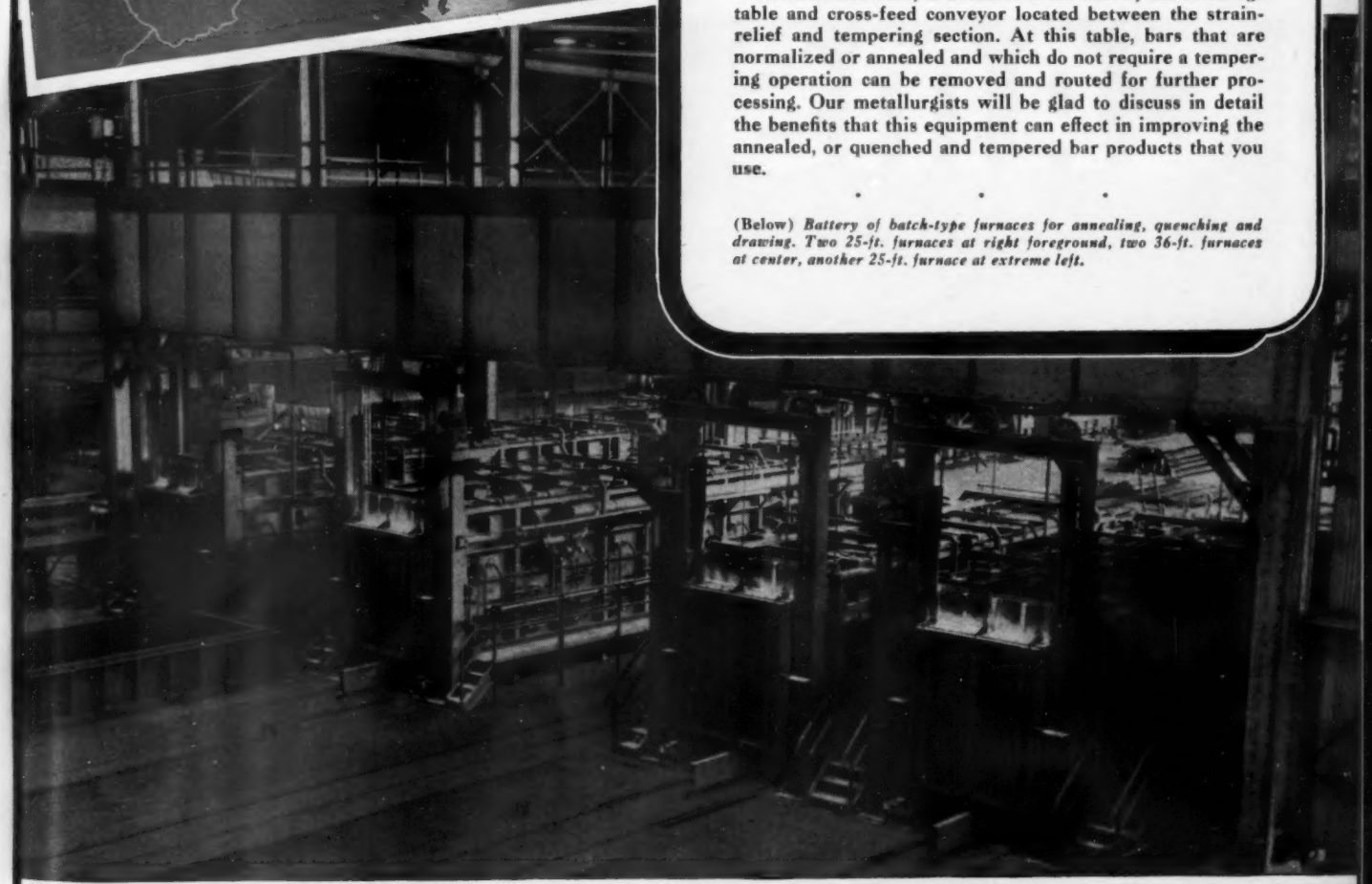
Novel straight-line, 7-chamber Continuous Heat-treating Furnace assures high and uniform quality

In sequence of operation, the line consists of (1) a heating section divided into preheating, intermediate, and high temperature chambers, each with separate doors; (2) a quenching tank for either oil or water quenching under automatic cycle control; (3) a strain-relief furnace; (4) center discharge and cross-feed transfer table, and (5) a tempering section. This last section, like the heating section, is also divided into three chambers, each with separate doors.

Extreme flexibility is obtained in the unit by the discharge table and cross-feed conveyor located between the strain-relief and tempering section. At this table, bars that are normalized or annealed and which do not require a tempering operation can be removed and routed for further processing. Our metallurgists will be glad to discuss in detail the benefits that this equipment can effect in improving the annealed, or quenched and tempered bar products that you use.

. . .

(Below) *Battery of batch-type furnaces for annealing, quenching and drawing. Two 25-ft. furnaces at right foreground, two 36-ft. furnaces at center, another 25-ft. furnace at extreme left.*



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"Hold fast!"

When all depends on *holding fast*, you can depend on ALLENS. In machines of war and machinery of production, "Allens" hold with a grip that never lets go. Made of strongest adaptable alloy steel, formed and threaded by pressure-processes, "Allens" stand punishing set-ups. Precision-threaded to a high "Class 3" fit, they bear evenly on *all* threaded surfaces in the tapped hole. They resist slippage, defy breakage.

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One KENNAMETAL LATHE FILE removed the burrs from 100,000 shells as compared to 800 to 1,000 shells by a steel file—a production ratio of 100 to one!

Just as the introduction of KENNAMETAL-tipped milling cutters in 1939 is revolutionizing the milling of steel, the NEW KENNAMETAL LATHE FILE promises to establish new standards of efficiency and economy in the filing of steel and other metals. For example . . .

- ★ KENNAMETAL Lathe Files permit filing speeds of 3 to 10 times that possible with steel files, matching the unusually high cutting speeds of KENNAMETAL carbide tools.
- ★ KENNAMETAL Lathe Files do not burn up at high speeds but outlast steel files 50 to 200 times.
- ★ KENNAMETAL Lathe Files cut hardened steels up to 62 Rockwell C which the ordinary file will not touch . . . do a noteworthy job on cast iron and brass at surface speeds around 900 feet per minute, and efficiently file high-carbon, high-chromium steels at 800 surface feet per minute.

At present, KENNAMETAL LATHE FILES are available in one size—Style F-76, illustrated. It is 11" long, ¾" wide, and ⅜" thick, having a substantial filing surface 4" long of grade K4H KENNAMETAL (80.6 Rockwell C), single cut with teeth at 30° shear angle, 40 per inch. Shank is shaped for convenient handling.

PRICES—1 to 9 files . . $15.00 each
10 to 99 files . 13.00 each
100 or more . 12.30 each
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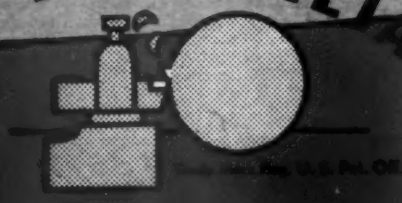
KENNAMETAL



KENNAMETAL Inc.
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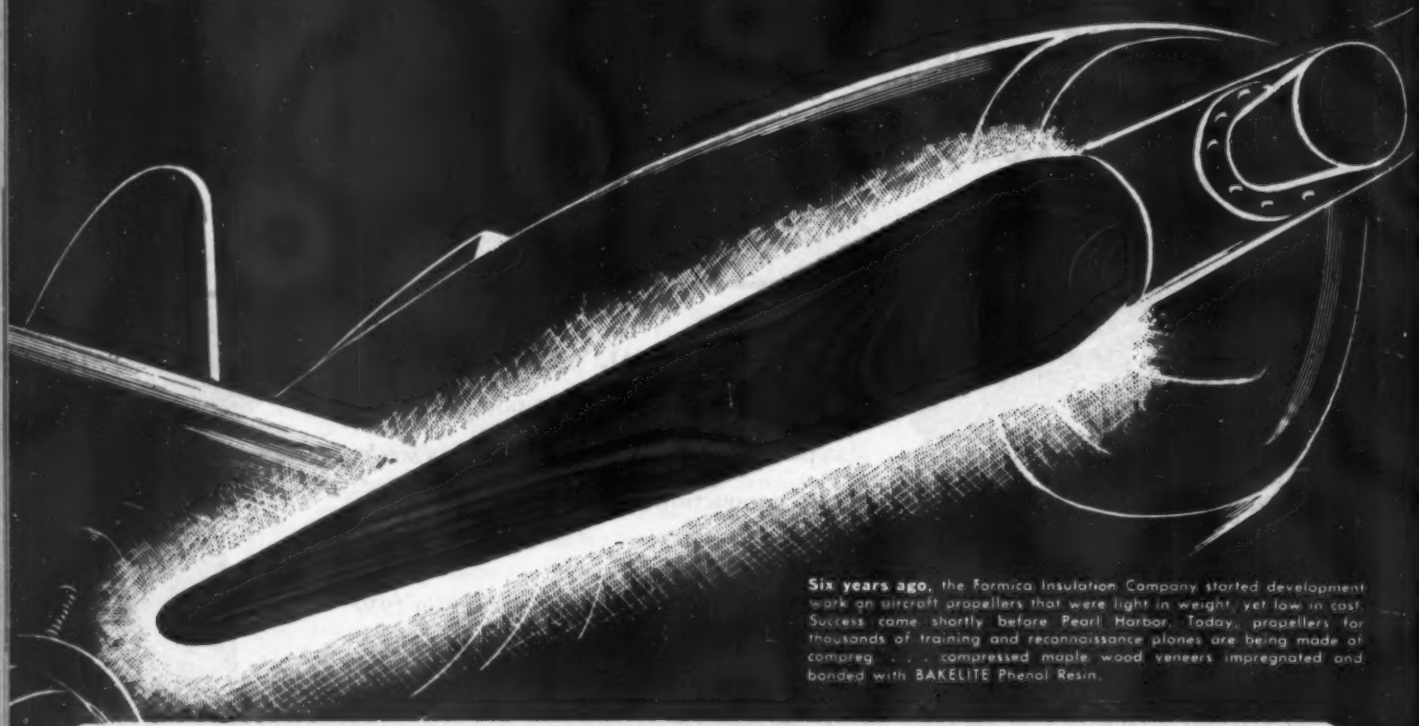
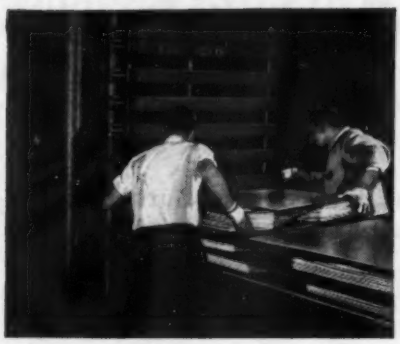
SUPERIOR CEMENTED CARBIDES

How can BAKELITE Plastics



Six years ago, the Formica Insulation Company started development work on aircraft propellers that were light in weight, yet low in cost. Success came shortly before Pearl Harbor. Today, propellers for thousands of training and reconnaissance planes are being made of compreg . . . compressed maple wood veneers impregnated and bonded with BAKELITE Phenol Resin.

Choice maple veneers are placed in a cage, lowered into a vat of BAKELITE Phenol Resin. Vacuum, then pressure, assures complete saturation into the wood of this thermosetting resin. Later the veneers are removed and stacked to dry.



The impregnated veneers are then laid up and placed in a hydraulic hot-press. Here the heat softens the resin, the pressure compresses the wood to one-half its original thickness. Under continued heat, the resin sets. The result is a plank of compreg.

Here a worker is shown planing the densified wood block to assure perfect bonding in later operations. Measured in the grain direction these compreg planks can be said to have a weight-strength ratio of one-half the weight per volume of aluminum.

The planks of compreg are then coated with BAKELITE Phenol Resin and laid up to form the rough shape of the finished propeller blade. The metal plates dividing each unit are electrodes that will carry the high-frequency current used to bond the compreg planks to a single block of densified wood.

In the electrostatic press, high-frequency electrical current is passed through the entire propeller assembly, generating uniform heat throughout its entire depth. This is extremely important since only hot-setting resins can give the necessary bond, and since the tremendous thickness makes it impossible to use the steam platen or oven-heating processes.

After removal from the press, the blocks are rough-cut, then finished to form lightplane propeller blades. Although made of wood, these blades are water-resistant . . . have a tensile strength of 30,000 pounds per square inch, flexural strength of 40,000 pounds, and sheer strength of 8,000 pounds.

improve your products?

Can you produce them faster?... Can you improve them structurally, electrically, mechanically?... Can you build them at lower cost? The answer has been "Yes" for hundreds of products whose manufacturers have investigated BAKELITE Plastics.

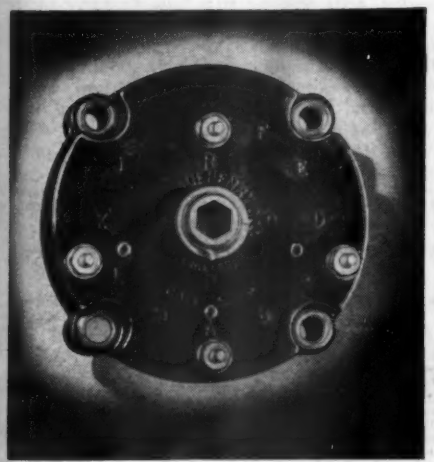
Complex shapes are being molded quicker... resulting in sturdy, finished parts at remarkably low cost. Coatings and finishes have been developed with BAKELITE Resin bases that are easier to apply, and that are far more durable and resistant. Wood has been given new strength and endurance... is now being fabricated in curved plywood sections up to 84 feet in length. Cloth laminated with BAKELITE Laminating Varnishes saves 45 per cent in weight of fighter plane ammunition boxes.

These and other examples illustrated on these pages are typical of the scores of applications and developments that you will keep posted on when you are in touch with Bakelite Plastics Headquarters. Our Engineering Staff and Development Laboratories can help you with essential problems. The literature illustrated below can help you with your present and postwar planning.

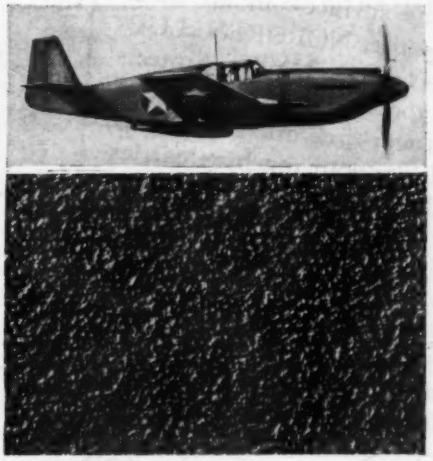
Write for specific technical literature today. Please address Dept. 1

BAKELITE CORPORATION
Unit of Union Carbide & Carbon Corporation
UCC
30 EAST 42ND STREET, NEW YORK 17, N. Y.

The preselector dial drum that automatically figures the gear ratios and speeds in the use of a No. 5 Warner & Swasey turret lathe was formerly made of metal. It is now molded of a BAKELITE *General Purpose* Phenolic Plastic eliminating several machining operations. The conversion has meant an important savings of metal and a reduction in production costs of approximately 80 percent.



After designing a new type rotary cam selector switch for sequence switching on airplanes, the Paul Henry Company found that simplified production and low cost demanded the use of a molded plastic. But which one? Experimentation pointed to a BAKELITE *Impact-Resistant* Phenolic. Further tests proved this material to have good electrical characteristics, high impact and tensile strengths, excellent heat and moisture resistance. Sales are up, production costs are down 20 percent... because this manufacturer investigated BAKELITE Plastics.



On the steps, catwalks, and cockpit floors of military aircraft, a covering that will withstand wear, yet be skid-proof, is absolutely essential. Rubber is slippery when wet. Other materials wouldn't stand the abuse. The Western States Lacquer Company developed an abrasive coating, particles of hard aggregate suspended in a rubber-like BAKELITE Plastic base. Sprayed or troweled on, this new coating gives a resilient, sandpaper-like surface to the flooring of some of America's leading bombing and fighter planes.

Deck houses for small boats are now being molded of plywood in a single piece. At the Haskelite Manufacturing Company's plant, veneers of wood coated with BAKELITE Resin Glue are laid in diagonal strips over a mold. Then low fluid pressure and controlled heat are applied which forces the plywood assembly to the exact contour of the mold and sets the glue. The finished deck house is 12 feet long, 9½ feet wide, and 8 feet high. It is light, strong, and durable.

USEFUL LITERATURE ON PLASTICS

"A Simplified Guide to Bakelite Plastics" gives a summary of the principal BAKELITE Plastics now available. It describes each type briefly, and illustrates typical applications. **"Bakelite Molding Plastics"** provides further information, and A.S.T.M. data on moldable plastics. **"Molding Technic for Bakelite and Vinylite Plastics"** is a 224-page manual on the art of molding plastics. It contains comprehensive data that the designer, engineer, molder, and user should have on the design and fabrication of hot-set and cold-set molding materials. Price $3.50 postpaid. Additional pamphlets and booklets describing other types of BAKELITE Plastics are also available. Write to Department 1 requesting these valuable guidebooks.

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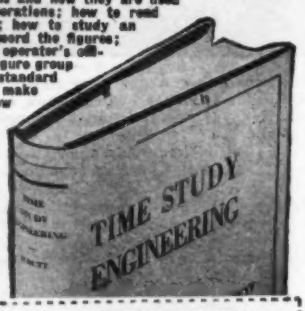

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Speed of assembly often doubled . . . because there are no fumbled starts, or crooked screws to back out and re-drive. Spiral and power drivers are made practical, and the 4-winged bit aligns itself in the tapered recess of the screw head . . . drives automatically straight.

Greater safety . . . both for workers and their work. Driver can't twist out to gash hands, spoil work by gouging or puncturing, or leave any snagging burrs on screw heads.

Lower cost . . . savings of 50% in assembly time are not unusual with American Phillips Screws. Production is increased . . . workers are trained in less time . . . spoiled work and lost-time accidents are eliminated. Uniformly high quality is assured by American's constant research in materials and methods, and by individual inspection of screw head, thread, and point.

Now add the final extras of American delivery service and engineering assistance on special fastening problems . . . then you *know* why everyone who ever tried American Phillips Screws is using them today . . . *and why those who have come to use them in time of war will continue to use them in time of peace.*

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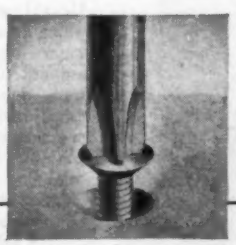

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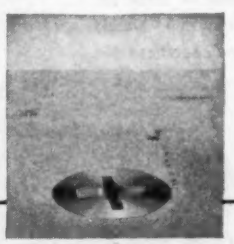

3. **Better Fastenings**—Screws are set up uniformly tight, without burring or breaking heads. A stronger, neater job results and there are no gouges on work-surface.

OUT OUR WAY
BY J. R. WILLIAMS
I QUIT! WITH ALL THEM DAMES ON THE MACHINES A GUY'S SELF RESPECT AIN'T WORTH A HOOT AROUND HERE. I'M GONNA JOIN THE ARMY!
O.K., DAVE. IT'S YOUR OWN BUSINESS!
YOU'D THINK HE'D PUT UP WITH ANYTHIN' WITH ALL TH' DOUGH HE'S MAKIN' THESE DAYS! HE MUST BE OFF HIS NUT!
NAW, IT'S HIS PRIDE. THE DAMES IS MAKIN' HIS JOB LOOK TOO EASY! I FIGURE HE'S CLEARIN' OUT BEFORE THE BULL O' TH' WOODS GITS THE IDEA OF PUTTIN' A BROOM IN HIS HAND.
J.R.WILLIAMS

The 'Old Bull' will make out...

Sure he's got his problems these days, but he's taking them right in stride. He's seeing to it that the production lines keep rolling full blast and that the tools of Victory are moving up to *keep* our fighting men the best equipped and supplied in the world. And it's this day-in and day-out production for war that is uncovering new, better, quicker ways of doing things... new methods and uses for precision instruments which are playing such a revolutionary part in modern warfare, and which will open up new worlds of wonders in post-war days.

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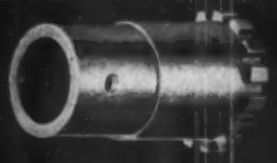

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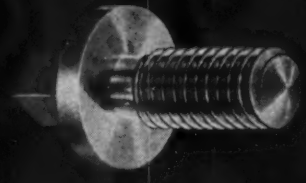

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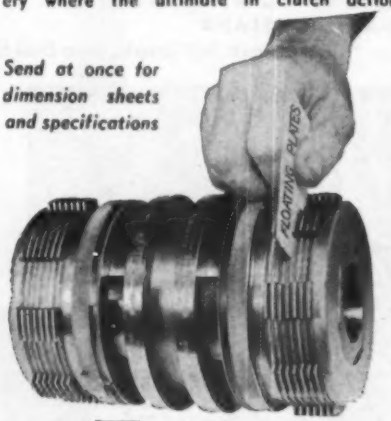

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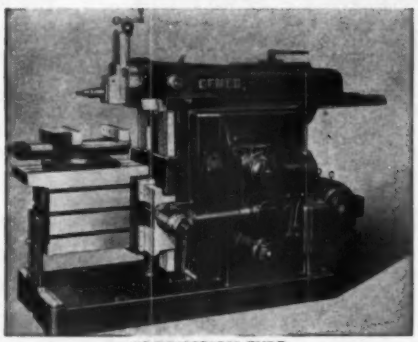

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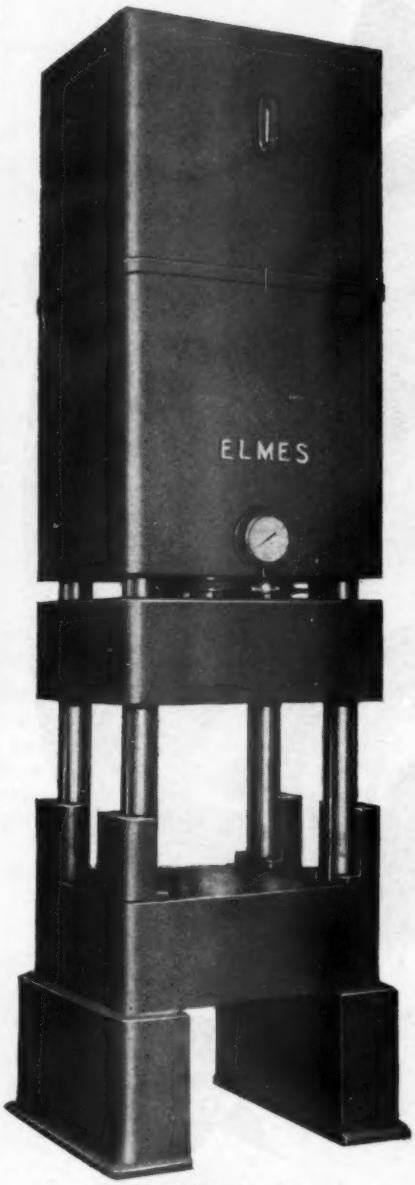

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Rugged, strictly precision and highly accurate unit, entirely self-contained.

ELMES Engineers Studied His Problem... An Elmes Hydraulic Press Was Installed... With These Startling Results:

This manufacturer, doing war work which cannot be disclosed, used a press which, though capable of great speed, bent the metal so excessively that another operation, to bend it back, was necessary on a straightening press.

An Elmes hydraulic press, with a speed control of the pressure stroke, was selected to do this same job. It formed the piece perfectly in one operation. Not only did this Elmes press eliminate the second operation but it practically eliminated rejects and spoiled material. It saved one pressman's time, thus alleviating the manpower problem; and it released one press for duty elsewhere. At the same time, the controlled speed of the pressure stroke enabled this manufacturer to use a lower and less costly, yet equally as serviceable, grade of steel for this work.

ELMES ENGINEERING SERVICE ...AT YOUR SERVICE

In the light of this manufacturer's experience, perhaps the Elmes Engineering Staff can help you select or design more efficient hydraulic equipment: presses, pumps, accumulators, valves, accessories. Suggestions, recommendations, with cost estimates given without obligation.

ELMES ENGINEERING WORKS *of* AMERICAN STEEL FOUNDRIES, 1001-1013 Fulton St., Chicago 7

FEATURES THAT GUARANTEE OUTSTANDING PRESS PERFORMANCE

1. **HIGH SPEED.** Rapid transverse to work and from work, with automatic slow down and speed control for working part of stroke. Permits, in some instances, the use of a cheaper grade of drawing steel. Also reduces spoilage.
2. **VARIETY OF CONTROLS.** Manual, semi-automatic, automatic.
3. **FULL PRESSURE CAPACITY THROUGHOUT ENTIRE STROKE.**
4. **EXCEPTIONALLY ACCURATE GUIDING OF MOVING PLATENS.**
5. **DAMAGE DUE TO OVERLOAD DEFINITELY ELIMINATED.**
6. **STROKE CONTROL MINIMIZES IDLE STROKE.**
7. **DEFINITE TIME SAVING IN DIE SETUP.**
8. **COLUMN STOPS WILL TAKE FULL LOAD OFF PRESS.**

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Also Manufactured in Canada

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

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OF THE DODGE
TRANSMISSIONEER

WHAT IS TRANSMISSIONEERING?

Transmissioneering is a Dodge engineering technique starting with a study of practical production engineering requirements and resulting in "The Right Drive for Every Job." It is the connecting link between power source and production machine.

Transmissioneering involves the component parts of power drives — bearings — pulleys — sheaves, clutches, etc., each transmissioneered to meet definite service conditions and the assembling of these parts to provide effective drive units.

Dodge transmissioneers in industrial centers provide on the job tranmissioneering and a wide selection of Dodge transmissioneered products available from stock. Call your local Dodge transmissioneer — he will show you how to put *all* your power in the job.

DODGE MANUFACTURING CORPORATION
Mishawaka, Indiana, U. S. A.

BUY MORE WAR BONDS

The Sign
of the Dodge
Transmissioneer
"Transmissioneering starts with the study of Practical Production Engineering requirements and stops with the Right Drive for Every Job."

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• • • THE RIGHT DRIVE FOR EVERY JOB

I'LL SAY IT'S MADE ACCURATELY...THEY ALL ARE

Behind the efficient, trouble-free power transmission service from a Philadelphia Worm Reducer is the particular design and perfect meshing of the worm and worm wheel that produces a maximum rolling action and a minimum sliding action. Of course, this can only be achieved when the integral parts are extremely accurate... and Philadelphia Worm Reducers are just that. Little wonder that efficiency records of 85% to 95% are common.

Being made in both horizontal and vertical types, Philadelphia Worm Gear Units will fill the need exactly, practically anywhere a right angle drive is indicated. For details get our Catalog #25.

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INDUSTRIAL GEARS AND SPEED REDUCERS LIMITORQUE VALVE CONTROLS

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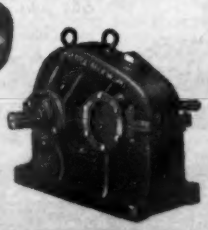
Philadelphia **LIMITORQUE CONTROL** operates all types of valves, etc., safely, economically, from convenient stations.

Philadelphia **GEARS** All types and sizes of industrial gears. Can be supplied in all materials.



Philadelphia **HERRINGBONE SPEED REDUCER** for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.

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(14 to 96 D. P.)

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With full *production capacity* scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every *urgent* need will be given careful consideration.

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CHICAGO

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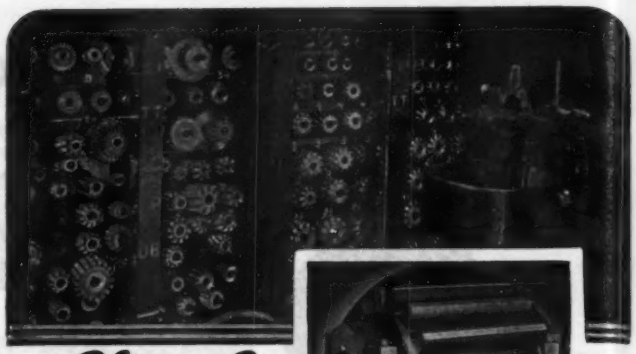
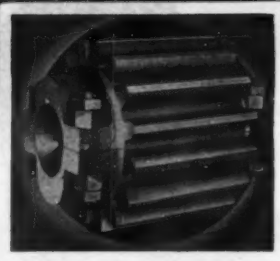


Clean-Cut GEARS



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Send us your blueprints and specifications today.

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GANSCHOW GEARS
FOR SIXTY YEARS
Spur—SPEED REDUCERS—Worm
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Despite the continued growth of our gear business we are still in position to give each customer the attention they have a right to expect.

We carry a complete stock of standard cut gears and can furnish special gears to your specifications.

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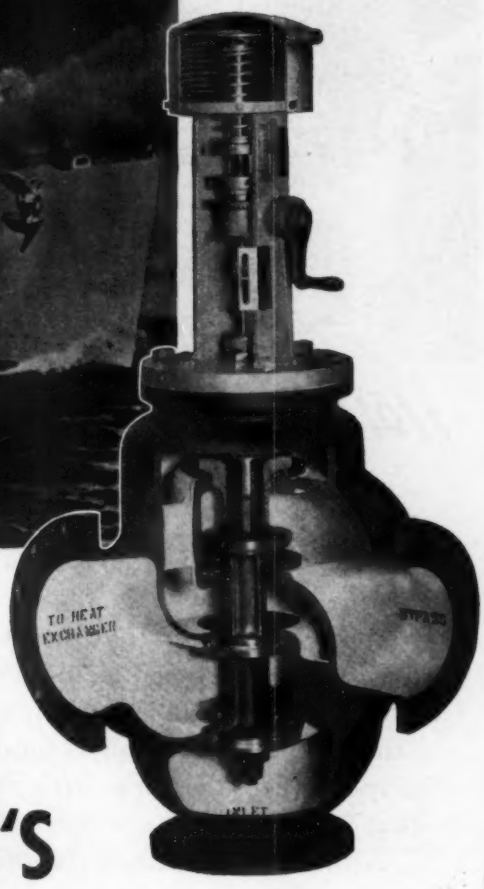

OHIO *Bevel* GEARS

picked for important job on

Hard Hitting Navy DE'S

Designed to combine heavy fire power with speed and quick maneuverability, these specialized craft, driven by huge Diesels, demand a flexibility of their engines that can be obtained only through precise control. And a vital factor in that control is the famed Fulton Sylphon Temperature Regulator.

By means of a sensitive bulb within the cooling system this regulator automatically controls the flow of water through this system. Manual opening and closing of the valve, if desired, is accomplished by a hand crank and Ohio Bevel Gears.

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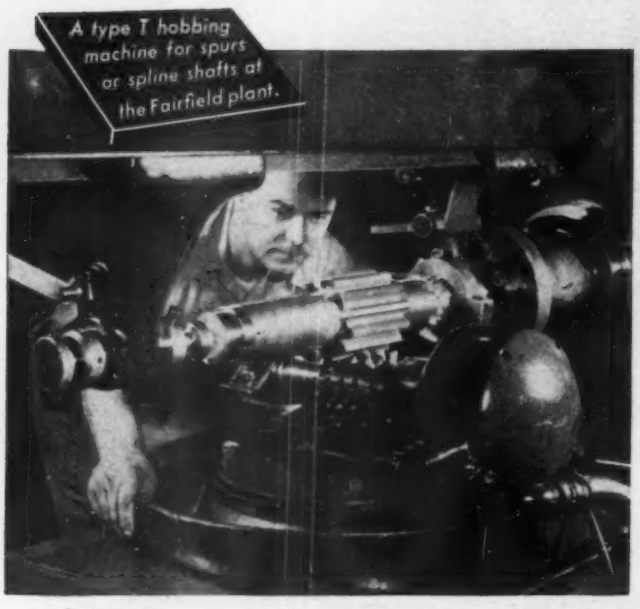

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. . . for the BATTLEFRONT

THE entire Fairfield organization feels that those on the production front have a solemn obligation to produce only the finest equipment possible for those on the battlefront. The skilled operator pictured above displays the typical painstaking attention that Fairfield men devote to their jobs.

Although the bulk of Fairfield production is spoken for far in advance, it is possible that we can help fill your gear requirements. It will be considered a privilege to answer your request for information.

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Military Equipment
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Tractors
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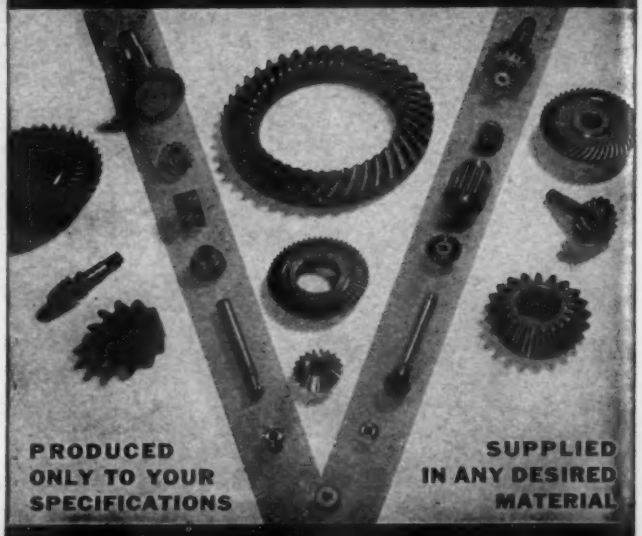

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SUPPLIED IN ANY DESIRED MATERIAL

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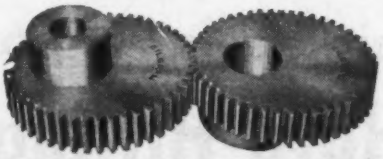
Makers of Quality Gears for 30 Years



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Also Other Non-Circular Gears

ALL TYPES OF GEARS

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BILGRAM GEAR & MACHINE WORKS
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New Design
New Features
New Advantages

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PRECISION GEARS

must pass rigid inspection before shipment.

There can be no question as to the accuracy of SIER-BATH GEARS. IF the specifications are right, the gears will be right. From start to finish, SIER-BATH works to closest tolerances. At every step in production precision instruments are used to check accuracy. No gear leaves the SIER-BATH modern gear plant until rigid inspection has shown it to meet SIER-BATH precision standards in every detail.

All sizes of gears from 2" to 52" — in all types — can be produced and shipped promptly on proper priority. Send your specifications for a SIER-BATH quotation.

SIER-BATH GEAR CO.

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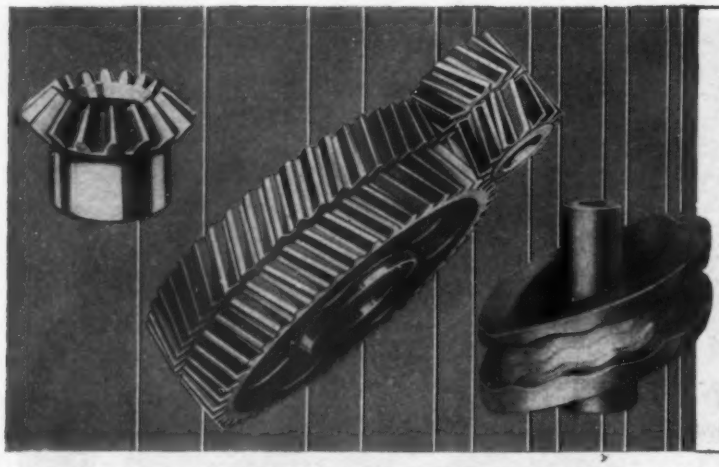
The Doorway to 38 years experience in making Precision Gears



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GEARS of every description cut to order

GEAR, CAM and THREAD grinding

AERONAUTICAL PARTS on contract basis

Send blue prints or samples for estimate. Accuracy of work guaranteed to your specifications.

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- ★ HELICAL
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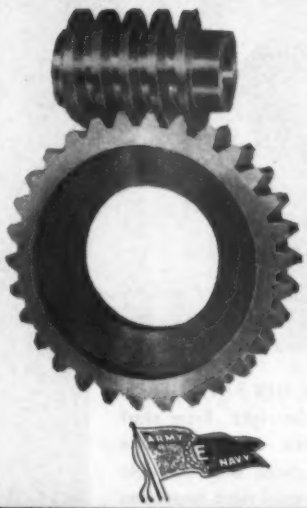
- ★ WORM
- ★ SPECIAL



When you need dependable and precise accuracy in your gears . . . call on us. Our organization is completely equipped and fully qualified to meet your every requirement for fine gears.

From our very beginning 40 years ago Cincinnati Gears have always been made to meet the specialized needs and specific requirements of each individual gear problem.

For Good Results we suggest you specify Cincinnati . . . "Gears, Good Gears Only".

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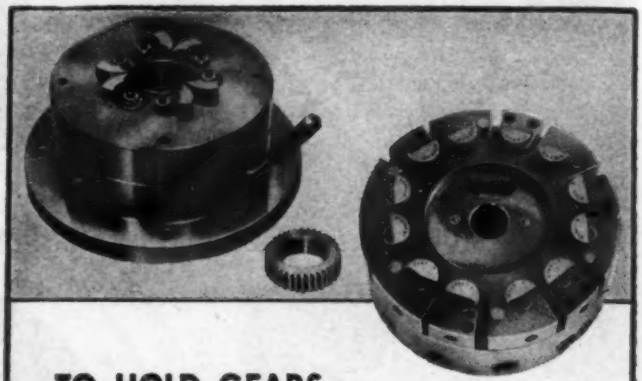
"Gears Good Gears Only"

Wooster Pike and Mariemont Ave. ★ Cincinnati 27, Ohio



TO HOLD GEARS

with precision for boring or grinding

HAVE TEETH GRIPPED ON LINE OF ACTION

Principle used only in

MATCH-IT GEAR CHUCKS

Method eliminates distortion. Gears have perfect, round holes. Made for internal and external gears, for spur and helical gears, and for countershaft type gears.

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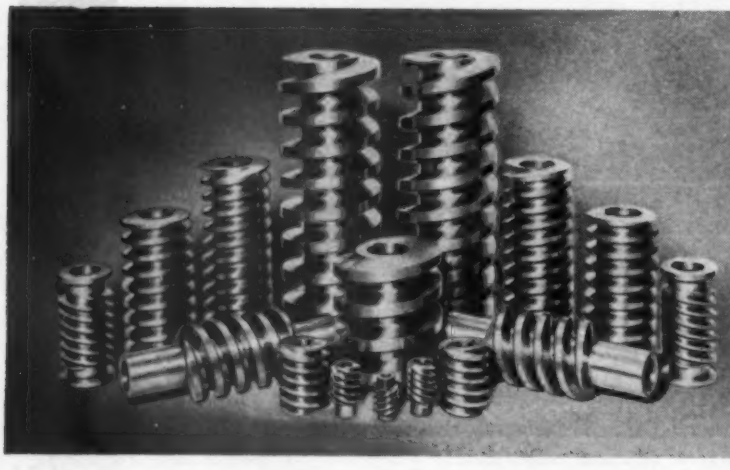

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SPUR — HELICAL — WORM

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Splined Shafts A Specialty

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Self Locking HOLLOW SET SCREWS

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Knurling of Socket Screws originated with "Unbrako" years ago.

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FAST, ACCURATE SPACING

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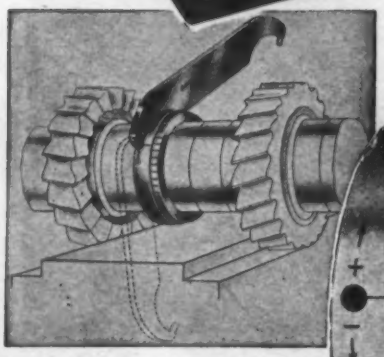
are made in 11 standard sizes for cutter arbors from 5/8" to 3".



You have .001½" plus or minus (up to ⅛" maximum) at your fingertips with Dayton Rogers ADJUSTABLE SPACING COLLARS. Graduated in thousands, you can make an accurate, positive adjustment in a hurry—just by loosening cutter arbor nut. Result: saved set-up time for increased production.

Try It! You'll never want to run any gang or multiple milling without them again. Write us today, giving name of dealer or supply house.

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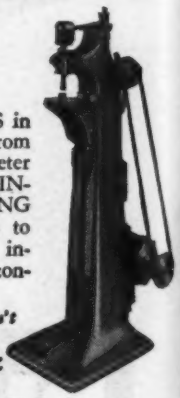
RIVETERS — PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



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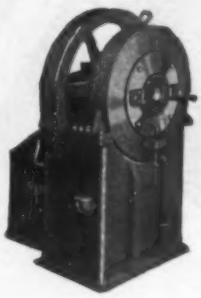

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SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

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Let's
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***By Buying* WAR BONDS**

"DIE-LESS" DUPLICATING

SAVES MAN HOURS and DELAYS

DIE ACCURACY WITHOUT DIES

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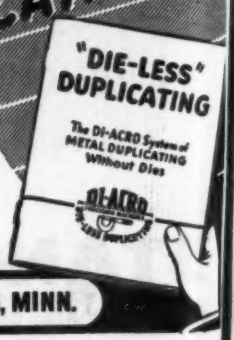

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING
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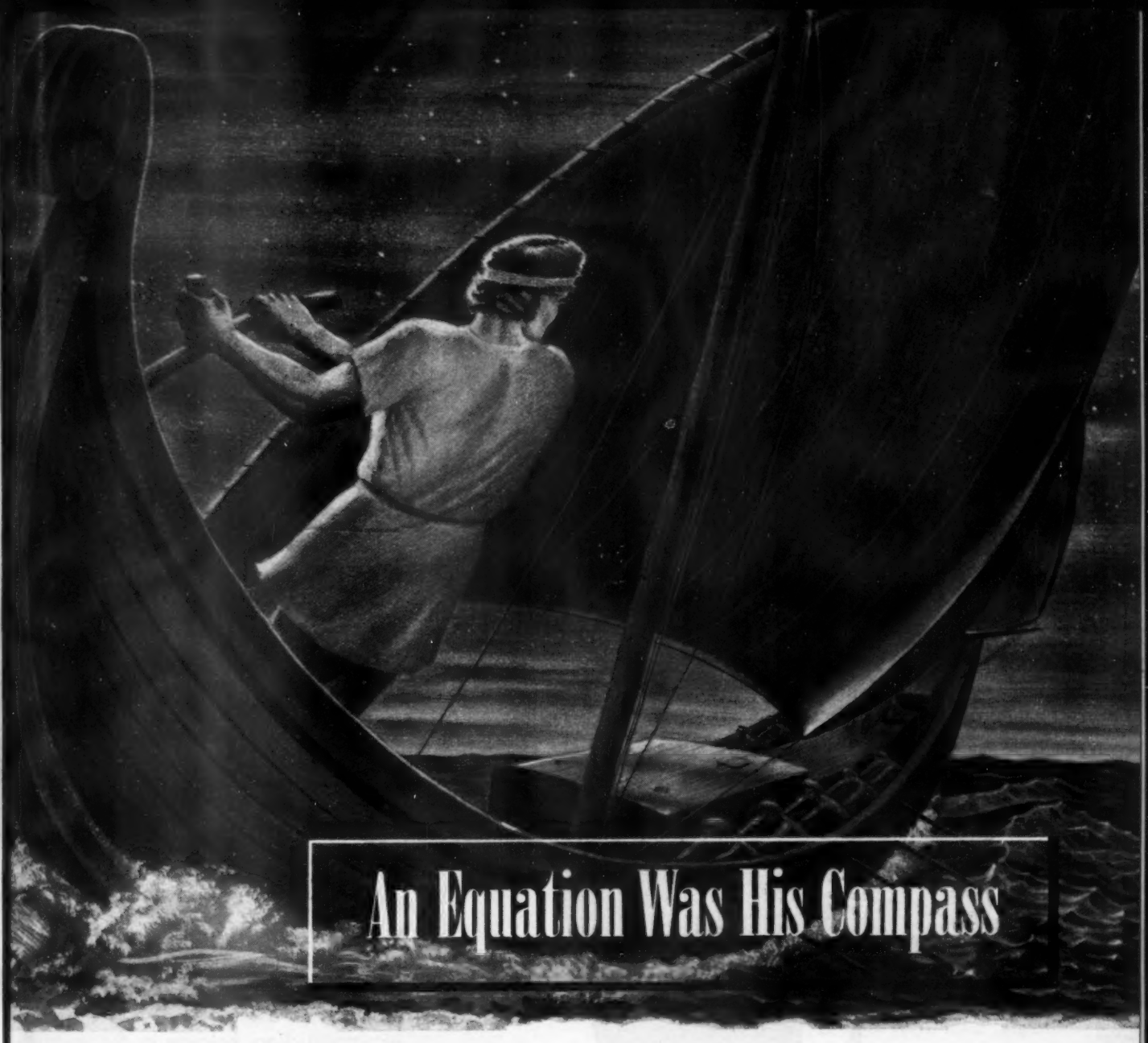
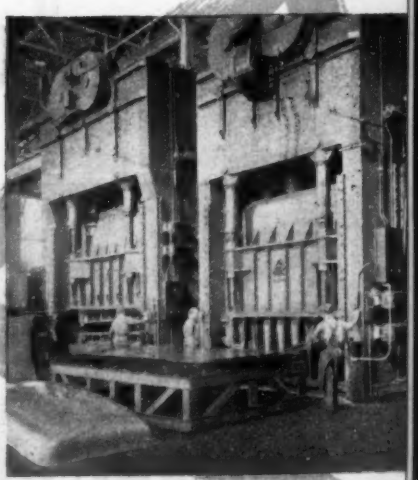


An Equation Was His Compass

The ancient Phoenician mariner who first placed his trust in mathematical reckoning for guidance over uncharted seas would probably feel at home in our modern world. He was one of the first to travel the way to the new worlds still to be opened by applied mathematics.

In the field of mechanics alone men of daring imagination and mathematical skill often accomplish the seemingly impossible. Many a Clearing Press, for example, now regarded as a "practical" solution to a production problem, was made possible because Clearing engineers had confidence in their calculations.

So even today, figures can be the compass pointing the way to many near and distant destinations. Clearing Machine Corporation, 6499 West 65th Street, Chicago 38, Ill.



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CLEARING

CLEARING PRESSES

MECHANICAL AND HYDRAULIC

HERE, A BATTERY OF ETNA SWAGING MACHINES

Speed production of 20 mm shells

● Military secrecy forbids naming this plant or its location . . . but we can say that here twenty ETNA Swaging Machines are playing a vital part in war-production; helping in the manufacture of 20 mm. shells on a mass production basis.

The operation consists of swaging a copper band on the shells . . . an important job, where speed and absolute accuracy is imperative. ETNA Swaging Machines meet every requirement, just as they have in plants throughout America, in war and peace.

ETNA Swaging units are built in 3/8" to 8" diameter capacities; 1" to 18" die lengths. Write for complete information today!

Let us show you how Swaging can speed production . . . save time and money.

Write today — we'll send complete information on ETNA Swaging Machines.

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

"Ask ETNA about Swaging"

The ETNA Machine Company

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New!

Close-Coupled

FOR TOP-SPEED MILLING!

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KENT-OWENS 2-20V VERTICAL MILLER BUILT WITH 3 GAPS

42" by 12" Table . . .
20" Table Travel . . .
Hydraulic Table Feed

★ With the new Kent-Owens No. 2-20V Vertical Milling Machine you can start milling jobs *right*... with the *right gap* for greater rigidity and top-speed production.

This machine is furnished at the factory with any one of three gaps from table to spindle nose. The base machine has a maximum gap of 10" . . . maximum gaps of 12" or 14" are available . . . each having 4" vertical quill adjustment. This close-coupled construction provides unusual rigidity and thus permits using maximum feed rates. Send for new bulletin. Kent-Owens Machine Co., Toledo, Ohio.

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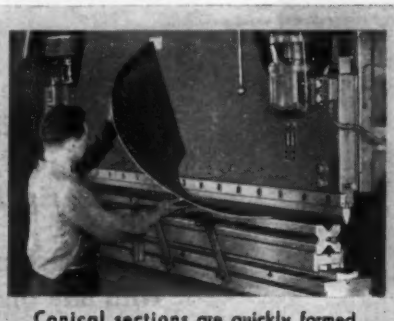
A STEELWELD IS NEEDED . . .

Whether you make army tanks, boilers, railroad cars, ships, machinery or airplanes, if you work with metal from 12 gauge to one inch thick, most likely you have great need for a Steelweld Bending Press.

Steelwelds are versatile tools that perform many types of work quickly and easily, whether only one piece or a production run is required. Long, sharp welded corners can be replaced by quickly made, smooth, round, bended ones, and both appearance and strength improved. Illustrated below are some of the many kinds of work that can be performed on any Steelweld.

It will pay you to investigate the many possibilities of this modern metal-forming tool that is improving product appearance and saving time and money for many enthusiastic users.

Corrugating and any straight-line production bending can be done to hairline accuracy.



Conical sections are quickly formed with standard bending dies by use of the ram-tapering mechanism.

Large diameter holes can be punched singly. Bolt holes and other holes can be punched 25 to 150 at a time.

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CATALOG No. 2002 gives complete construction and engineering details. Profusely illustrated

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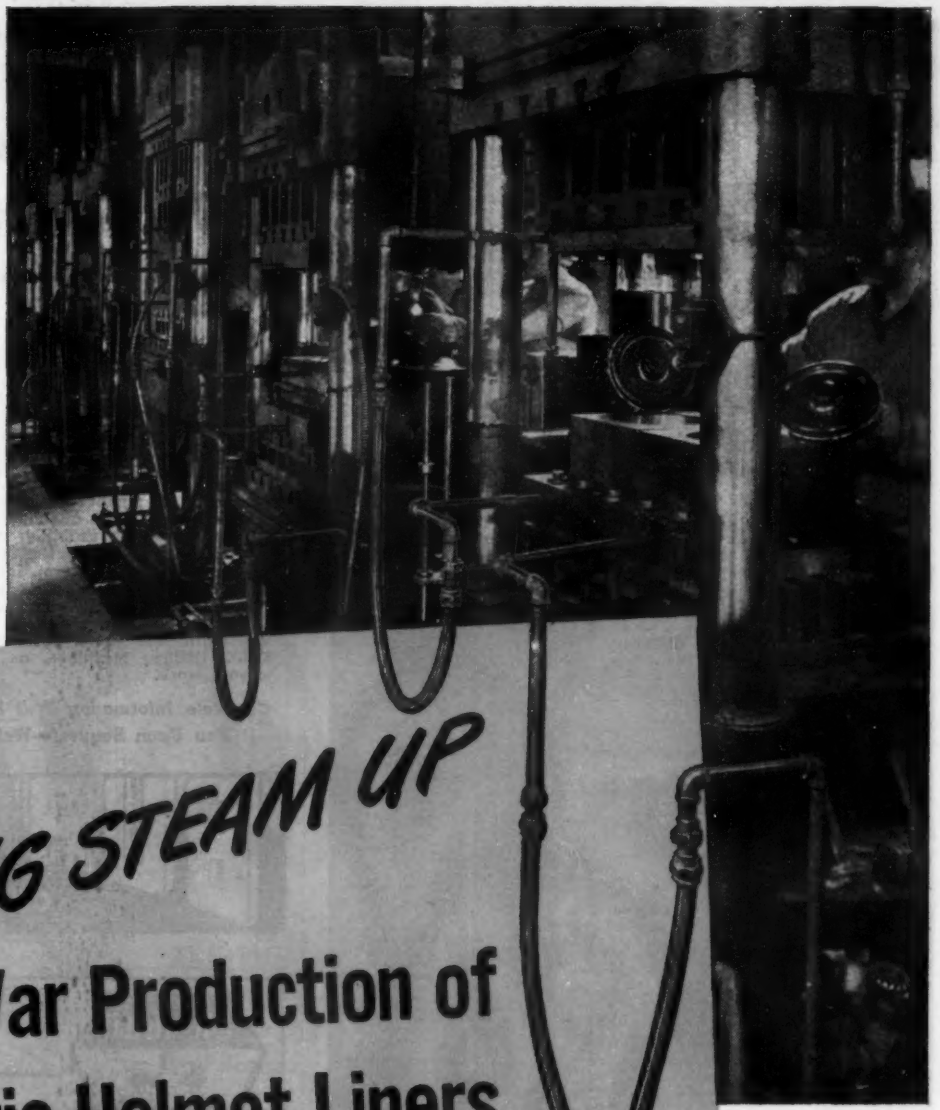

KEEPING STEAM UP for War Production of Plastic Helmet Liners

Way back in the relatively calm days of '39, the Molded Products Company of Chicago were making radio cases for the pleasure of ordinary citizens. In May of that year they equipped one press with steam connectors of American Flexible Seamless Tubing. In September they equipped two more presses. In March 1940, under the pressure of war contracts, they equipped additional presses. And in July 1942, with the plant on 100 percent war production of helmet liners and plastic wheels for hand trucks, the remaining presses were given the added security of these steam-tight, free-moving, long-lived connectors.

The experience of the Molded Products Company is but one more instance of American Metal Hose going in on trial . . . *and coming out on top.* Wherever a practically indestructible, flexible, air-tight conveyor is required, for oil, gas, or water; for vacuum service or for protecting electric wiring, American Flexible Metal Hose and Tubing are providing reliability and economy.

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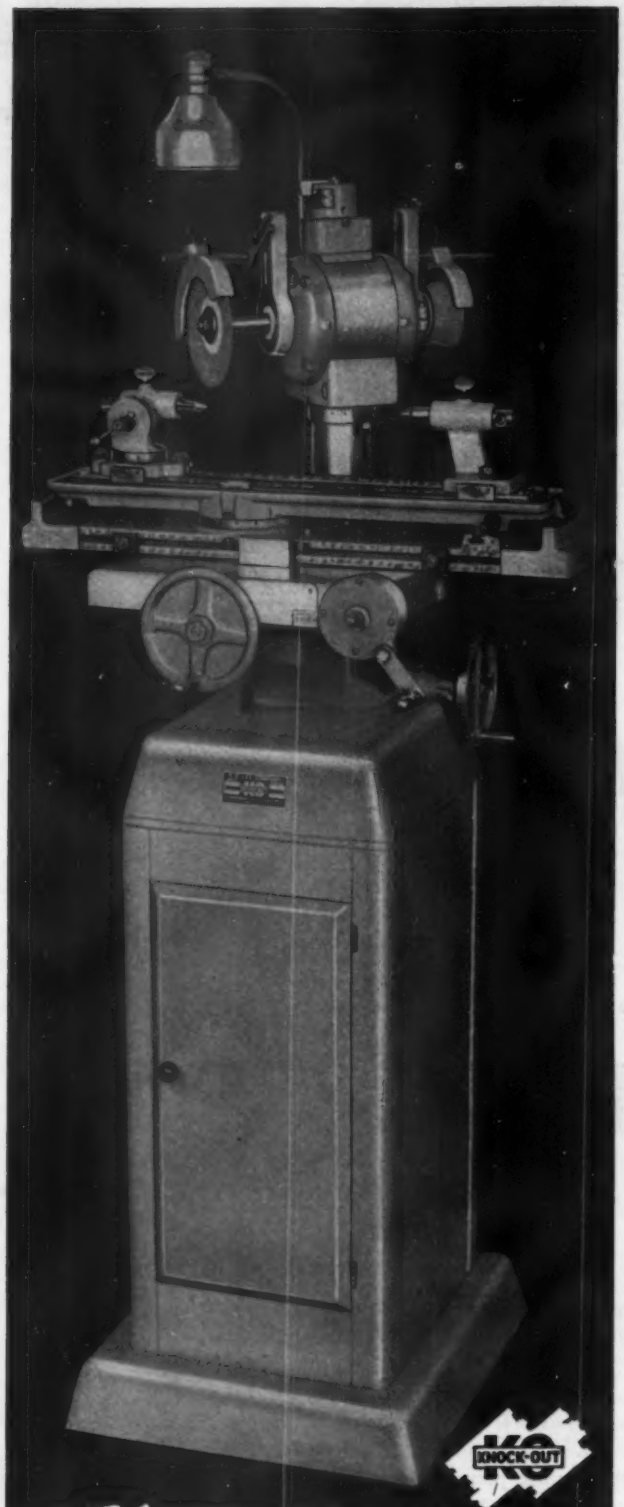

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UNIVERSAL TOOL GRINDER

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Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

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for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

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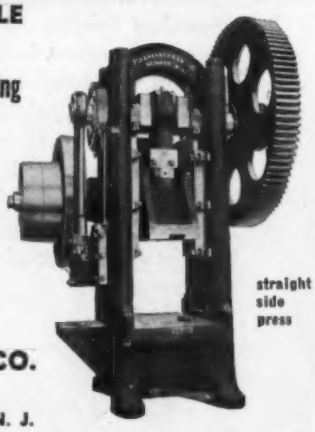

straight side press

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TRU-THREAD tools embody a radically new idea in the *manner* in which the diamond is used. This new idea employs the natural hardness of the uncut stone to achieve accuracy, speed, durability and economy that are truly remarkable.

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For forming wheels that grind
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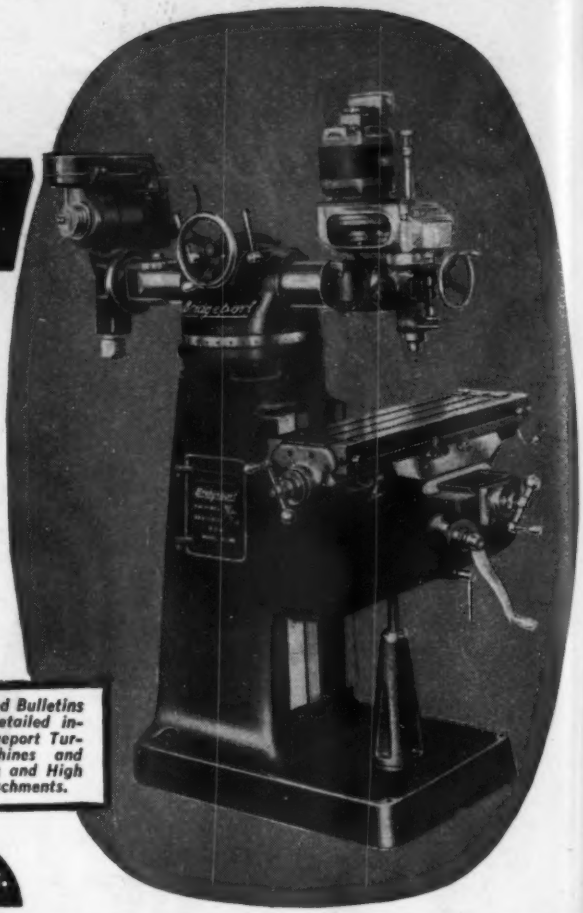
TURRET MILLING MACHINES



The new Bridgeport Shaping Attachment adds an extra feature which makes these machines capable of almost unlimited utility. Design is such that this new attachment can be mounted not only on existing Bridgeport Turret Milling Machines (shown here on back end of overarm) but also on other types of milling machines and special production equipment. Shaping operations can be performed at all angles making this attachment fast, and practical on die and mold work of all kinds as well as for intricate slotting on production jobs. The Bridgeport Shaping Attachment is now in production and is available promptly.

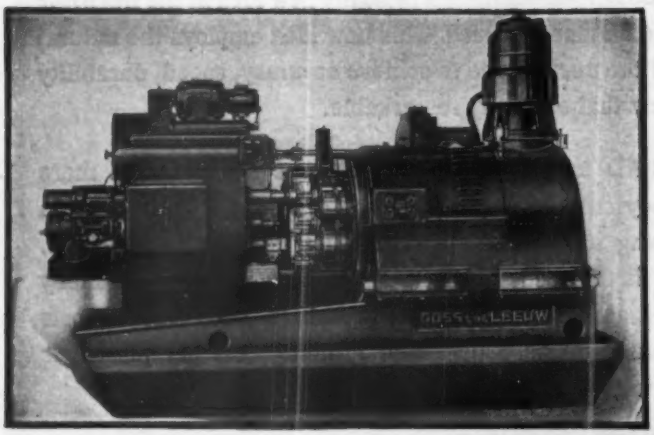
Investigate This Versatile Machine

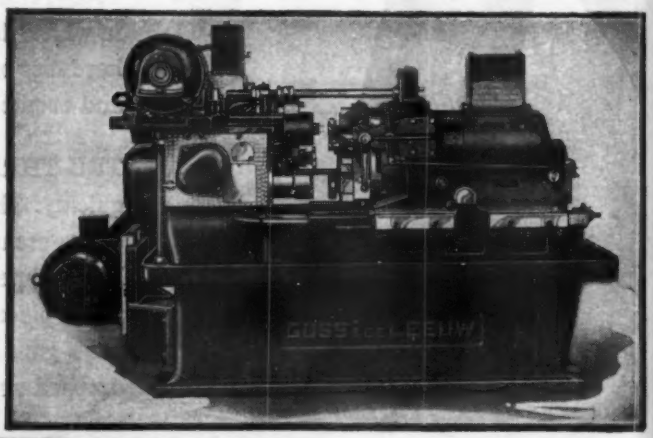
The Bridgeport Turret Milling Machine with High Speed Milling Attachment handles milling, drilling and boring at all angles with maximum ease and convenience. It can be depended on for accuracy and speed on a wide range of work. It is sturdy and powerful—a precision machine for production demands.
Features of the machine include: 15" diameter turret with 5" overarm, rugged construction, table, knee and saddle in convenient front-of-machine position, anti-friction bearings throughout, keyed overarm with worm wheel control for angular settings, large diameter graduated dials.

Bridgeport High Speed Milling Attachments are available as separate units (¼ HP and ½ HP) for use on other types of milling machines and production equipment. They are extensively used in all branches of the metal working industry and making a valuable contribution to war production.

Write for Illustrated Bulletins giving complete detailed information on Bridgeport Turret Milling Machines and Bridgeport Shaping and High Speed Milling Attachments.

THE BRIDGEPORT MACHINES, INC., *Bridgeport, Conn.*





WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

CUTTING TOOL TIPS FROM THE TOP-NOTCHERS

"In Precision Grinding make certain the wheel fits the operation"

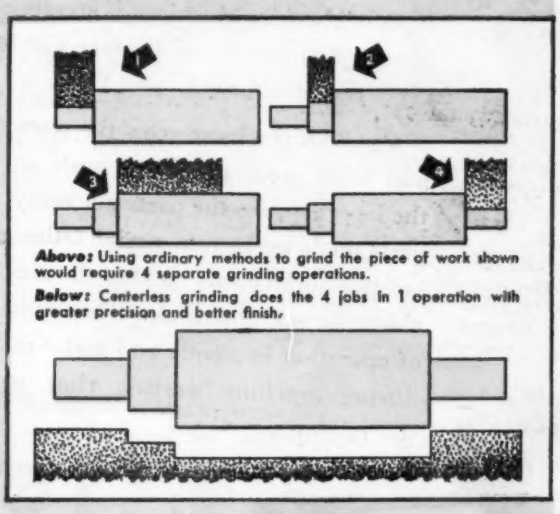
says C. E. QUAY, General Mgr.
OHIO TOOL COMPANY
Cleveland, Ohio

Ohio Tool Company, engaged 100% in war work, is today one of the largest manufacturers of small arms ammunition tools. This accomplishment has been made possible by the development of new methods and equipment, which, in turn, have resulted in a higher rate of production at lower cost.

"TO use a different wheel for every grinding operation in the plant would be a highly impractical and costly proposition. On the other hand, using too few wheels to do a multiple number of jobs sacrifices accuracy and speed of production; requires more manual handling.

"The answer to this problem is profile or centerless grinding . . . a development that grew from the unprecedented production demands of World War II. Precision profile grinding, for example, has made it possible to finish small arms ammunition tools, principally punches, on a production basis. Previously they had been ground singly or a few at a time on conventional tool-room grinding equipment. Internal grinding to finishes of 2 to 4 micro inches is not uncommon on small arms ammunition tools.

"As the sketches below indicate, the ability to centerless-grind several diameters, including tapers, radii, profiles, etc., simultaneously, has reduced what formerly required several operations, to one. In this way, less equipment is needed to produce larger quantities of more uniform tools, releasing additional equipment for other war necessities."



Above: Using ordinary methods to grind the piece of work shown would require 4 separate grinding operations.

Below: Centerless grinding does the 4 jobs in 1 operation with greater precision and better finish.

The proper selection of grinding oils is as important as the selection of the correct grinding wheel. That's why Shell Lubrication Engineers have developed a control technique that "tailor-makes" the oil to fit the machine, the application, and the tool. Ask the Shell man for the details.

SHELL CUTTING OILS

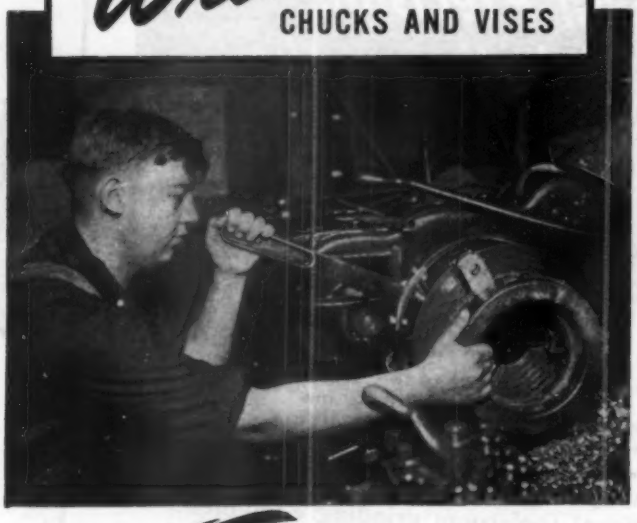
FOR METAL CUTTING AND GRINDING

SHELL

THOMAS-BARKER

Wrenchless

CHUCKS AND VISES



Save Time—

PRODUCE MORE!

Easily Installed—
No Accessories Required

Thomas-Barker Wrenchless chucks are made in 3-jaw (shown above) and 2-jaw types.

● Output by turrets, engine lathes, pipe threading machines, cutting off machines, drill presses, and other types of chucking machines, is greatly increased by the use of Thomas-Barker Wrenchless Chucks and Vises.

A pull on the lever grips the piece part with great power—a push on the lever releases the part. For many parts made on turrets, engine lathes, etc. it is unnecessary to stop the machine to set the work. The cycle of operation is simple and fast—reducing machine waiting time to the minimum.

Thomas-Barker Wrenchless vises are available in 3-jaw (shown below) and 2-jaw types.

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DoALL Products listed on this page, used in conjunction with any good surface grinder give a grinding service second to none for regular production or for tool room operations requiring grinding to very close tolerances.

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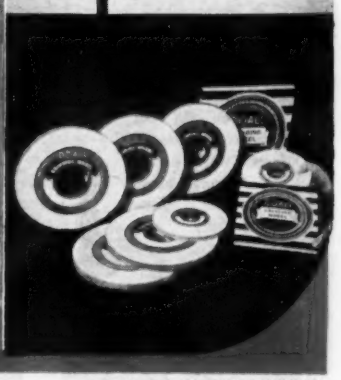

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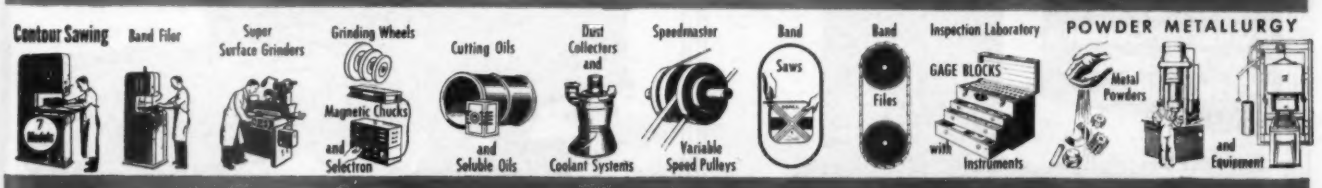

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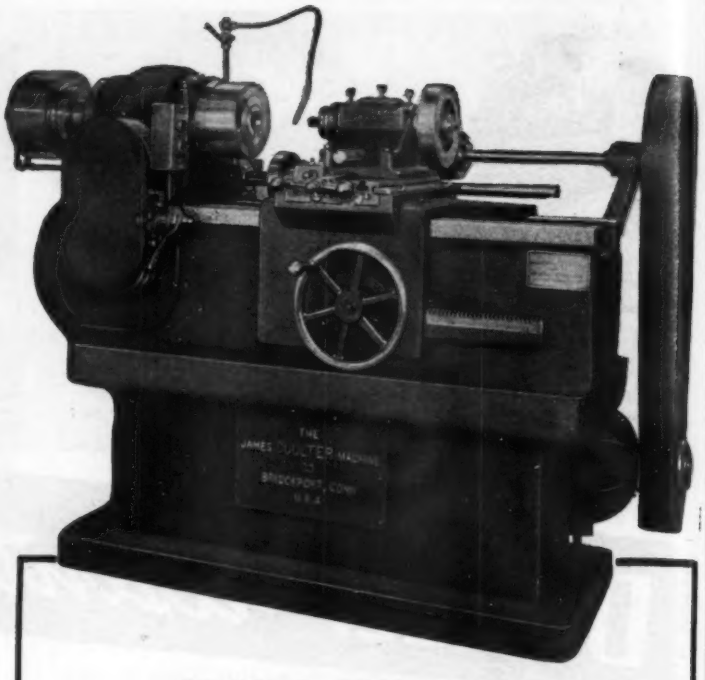

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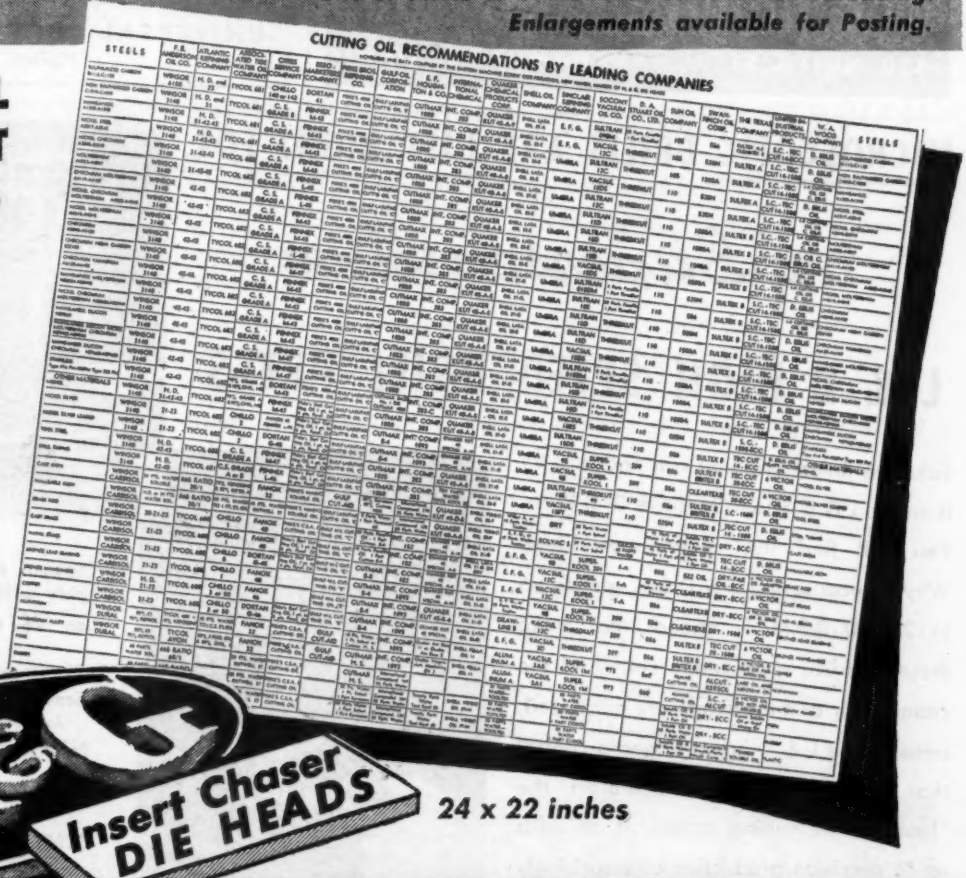
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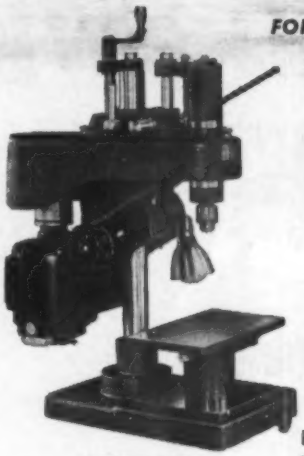

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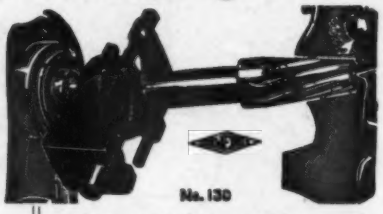
Simplify Spacing and Indexing with a Red E compensating milling machine dog which has a sliding universal joint that overcomes the difficulty of indexing work held between the dividing head and tail stock center of an universal milling machine.



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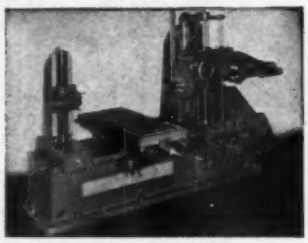

Standard Universal 3" Spindle Machine

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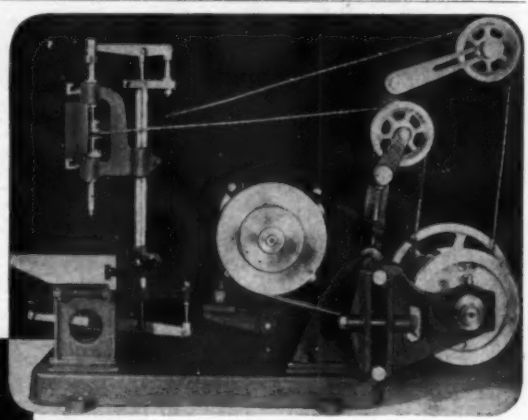
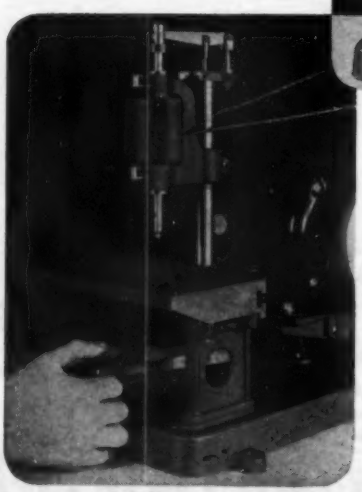


Take the tiniest drill you can find and try it on the L & D Super Sensitive Drill Press. You will find this combination ideal. Why? Because the L & D has speeds up to 23,000 R.P.M. — speeds that make those hair-like drills really cut. And the chances for drill breakage are minimized, because the L & D has a fingertip control that even gives green operators the "feel" of the cutting action. It all adds up to precision production at surprisingly low cost. Send the coupon for details.



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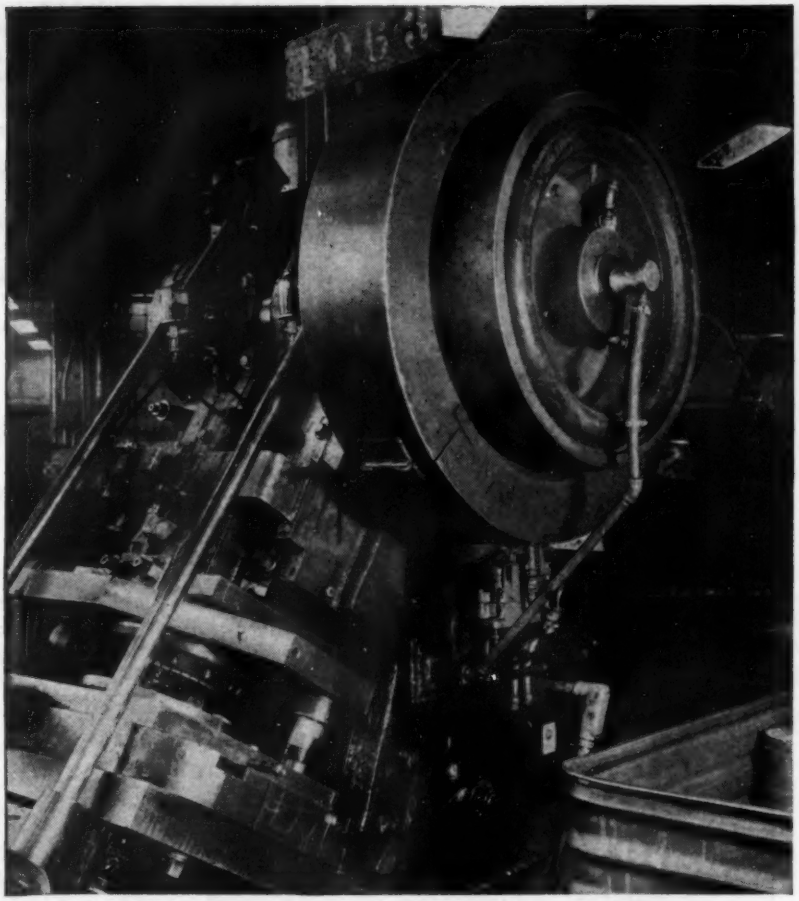
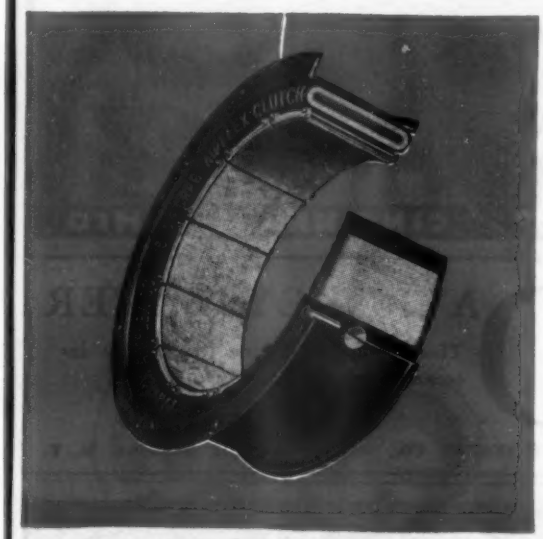
434 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

New Clutch for Heavy Machinery Drives





The Fawick Airflex principle—Power Controlled by Air—eliminates all levers, arms and toggles, absorbs shocks and vibration, requires few adjustments and no lubrication. Maintenance costs are unusually low.

PROVED IN THE TOUGHEST SERVICE!

The Fawick Airflex Clutch has proved its ability "to take it" in the hardest clutch service of all—naval vessels where instant maneuverability and positive control of drive means the difference between safety and disaster.

With this unmatched performance record, this clutch is fast becoming standard equipment for all types of heavy-duty machinery drives—on paper mills, rubber mills, hoists, cranes and drags, road machinery, oilfield drilling rigs, heavy presses and shears.

Where the going is toughest—where positive, trouble-free clutch service is a "must"—the Fawick Airflex Clutch is daily making new records for reliability and economy.

You are invited to consult our engineering department on all clutch problems.

FAWICK AIRFLEX COMPANY, INC.
9919 Clinton Rd. Cleveland 11, Ohio
In Britain, Crofts Engineers, Ltd., Bradford, England

FAWICK *Airflex* CLUTCH

POWER CONTROLLED BY AIR

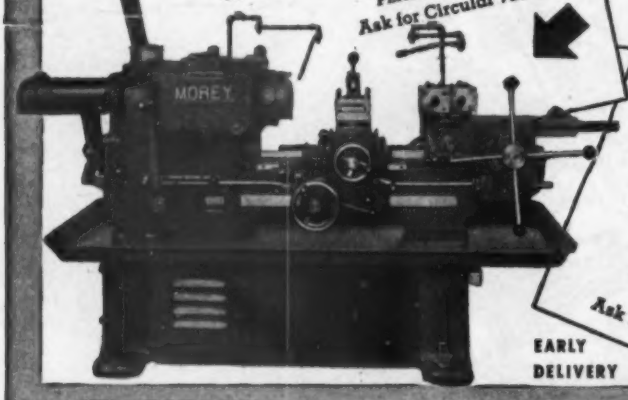
MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

#3 UNIVERSAL
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM.
constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

#2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 8½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

#4 UNIVERSAL
For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY



- INFINITE SPINDLE SPEEDS —Electronically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

The NEW "ABRASAW" No. 47
CUT-OFF MACHINE

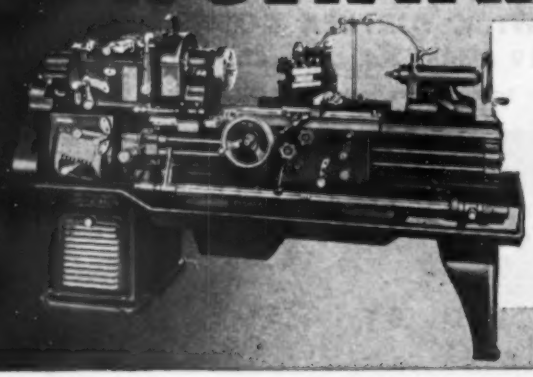
This pedestal type machine — improved and streamlined in appearance and construction — provides machine and base in a single casting. Large coolant tank is now in base of machine with coolant pump at the rear.
Vises can be furnished for straight or combination straight and angle cuts.
Capacity: Solids up to 1"; tubing and light sections up to 2".
Floor Space: 28" x 50".
Send for complete details.

THE BRIDGEPORT SAFETY EMERY WHEEL CO.
1286 W. Broad St., Bridgeport, Conn.

Sensitive DRILLING MACHINES
Avey
CINCINNATI OHIO

DAVIS KEYSEATER
This low cost machine will handle internal keyseating jobs up to 1¼ in.
Write for illustrated bulletin.
DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

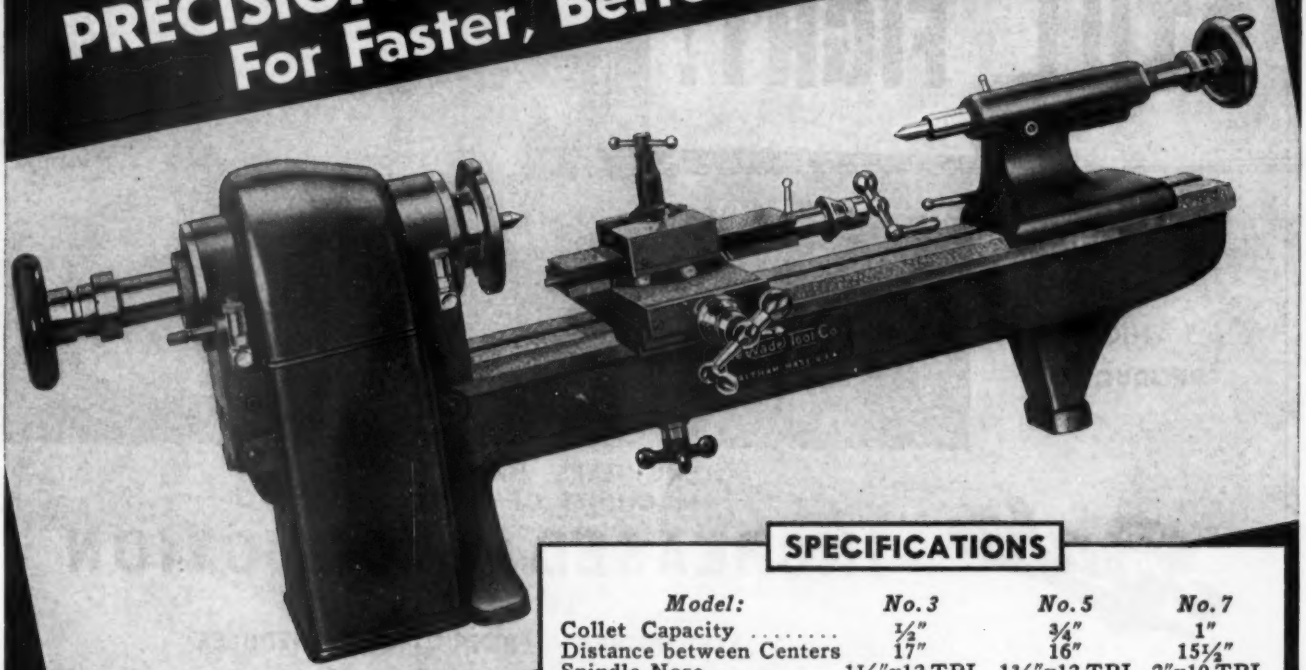
CINCINNATI LATHE



Inherently accurate on every job
In every detail of design and construction, accuracy of these modern, convenient lathes assures precision performance. For example: gears are cut to closest tolerance, hardened and ground; spindle is mounted on roller bearings taking thrust in both directions; ways and carriage are hand scraped to closest precision. A massive bed construction provides strength and stiffness which contribute to overall accuracy on heavy cuts. Made in sizes from 14" to 30" inclusive. Send for detailed specifications.

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

Wade Standard PRECISION BENCH LATHES For Faster, Better Production Work



SPECIFICATIONS

Model:	*No. 3*	*No. 5*	*No. 7*
Collet Capacity	½"	¾"	1"
Distance between Centers	17"	16"	15¼"
Spindle Nose	1½"x12 TPI	1¾"x12 TPI	2"x10 TPI
Weight with Standard Equipment and Compound Slide Rest	125 lbs.	135 lbs.	145 lbs.
Weight of Precision Screw Machine	—	172 lbs.	184 lbs.

All three models same as to following specifications: Swing, 7"; Length of Bed, 32"; Length of Short Bed, 21"; Taper, No. 1 Morse; Lead Screw, 10 TPI; Travel of Tailstock Spindle, 3"; Slide Rest Travel, 4¼".

Wade

Bench Lathes and Profilers For Precision, Versatility And Stamina

You can do faster, better production work on Wade Standard lathes because they are designed and built with features that give them top-notch efficiency for both toolmaking and production operations. They are sensitive and accurate machines that can stand the gaff and turn out plenty of work under modern conditions of quick high-low speeds, quick stops and starts.

These standard lathes are precision made . . . parts are interchangeable. Standard attachments can be added at any time to perform a wide range of machining operations . . . to meet your changing production needs. They are an exceptionally sound investment . . . they have versatility, low initial cost, low operating cost.

Write today for catalog

THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS

VETERANS OF OTHER WARS

STILL FIGHT!

ANOTHER
CONVERSION
for
HIGH
PRODUCTION

ENGINEERS HAVE PUT VETERAN
MACHINES OF OTHER WARS INTO

Buhr

INCREASED PRODUCTION

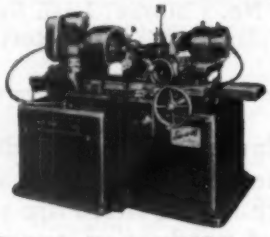
LET BUHR HELP
YOU INCREASE PRODUCTION SCHEDULES

Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment

ANN ARBOR **BUHR MACHINE TOOL COMPANY** MICHIGAN

The Sav-way M-H-2 Internal Grinder

Combines
Hand and
Hydraulic
Operation



Neoprene Insulated Against Vibration

For the first time in one machine, all the advantages of hand and hydraulic table operation! The bed is insulated from the base by neoprene pads, which prevent floor vibration and distortion of the base from being transmitted to the bed. Equipped with the famous Sav-Way Gold Seal Spindle—the spindle that breathes! Seventeen exclusive features.

This machine is setting production records in 'round-the-clock wartime operation.

Send the Coupon for Illustrated Literature

Sav-way INDUSTRIES • DETROIT
Machine Tool Division

Sav-Way Industries, Box 117, Harper Station, Detroit 13, Mich.
Please send descriptive literature covering the Sav-Way M-H-2 Grinder.

Name_____
Firm_____
Address_____
City_____ State_____ AM

WAR BONDS

are

WAR WEAPONS

★ ★ ★ ★

Invest to the limit!

War Production Gratified with Wide Applications for STANDARD JIGS...

SAVE TIME
A standard Siewek Drill Jig and adapter is easily and quickly set up—instantly ready to work on any particular part.

SAVE MATERIAL
Simple, material-saving adapters, as many as you need, fit the standard jig for a variety of jobs.

SAVE LABOR
In the toolroom, it is simpler and easier to make an adapter for the standard jig than a special jig for the job.

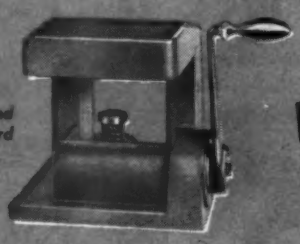
SAVE MONEY
One standard Siewek Drill Jig can take the place of dozens of special jigs.

At Left: Four E-2 Standard Spring Type Siewek Jigs on a rotary table.

Learn About Them Now for Efficiency in Finishing the War and Starting the Peace!

While there will always be the necessity for special jigs, standard jigs can be much more widely used in the shop than commonly believed—as is now being proven by amazing war production records. Futhermore, the reconversion to peacetime parts will not require a scrapping of these standard jigs—merely a replacement of the top plate and adapter.

It will pay dividends immediately on current production if you will find out now how standard Siewek Rapid Clamping Drill Jigs can be suited to your work. Contact a Siewek representative in your territory, or write us. *Send for Catalog No. 5J.*



Type N-Rack and Pinion Standard Siewek Jig.

SIEWEK

RAPID CLAMPING STANDARD DRILL JIGS

SPRING or RACK and PINION TYPES • SQUARE or OVAL TOP PLATES • WIDE RANGE OF SIZES

Designers and Builders of
SHEAR-CUT END MILLS

SIEWEK TOOL DIVISION
OF DOMESTIC INDUSTRIES, INC.
Detroit (Ferndale Station) Mich.
Representatives in Principal Cities

Affiliated with
SIEWEK ENGINEERING DIVISION
a nationally known organization staffed with experienced engineers—Consulting, Processing, Designing, Fabricating and Efficiency Methods
CHICAGO DETROIT HARTFORD

"Blount"

"COMBINATION" MODEL J

WET TOOL GRINDER

meets todays need for speed and accuracy

This machine is a valuable contribution to fast production. It is equipped with straight faced wheels for wet grinding, is remarkably convenient in operation and can be depended on for cool, clean grinding.

Modern and improved features include:

. . . heavy column with ample coolant tank and water pan of generous capacity.

. . . guards of heavy cast iron with hinged covers and adjustable spark protectors.

. . . centrifugal motor-driven ball bearing pump with all bearings above water line.

. . . spindle of high carbon steel, machine turned and ground.

. . . deep groove ball bearings protected against grit.

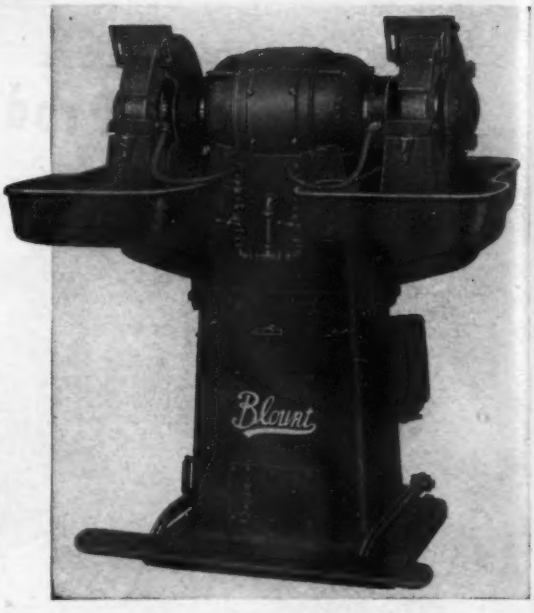
. . . exclusive design Blount grinding rest incorporating coolant ejector which assures cool tools and clean wheels.

. . . totally enclosed motor with manually operated switch having overload protection.

. . . foot treadle switch (available as an extra) keeps machine running only while operators foot depresses treadle.

Write for Bulletin A-8

COMPLETE DETAILS AVAILABLE ON REQUEST



CONDENSED SPECIFICATIONS

Base of Column—22" x 19½"
Height base to spindle—37½"
Spindle Arbor—1¼"
Wheels 12" x 2" x 1¼"
Between wheels—22½"
Spindle speed—1750 R.P.M.
Motor—2 HP.

J. G. BLOUNT COMPANY *Everett, Mass., U.S.A.*

ABRASIVE

ACCURACY BOOSTS PRODUCTION

No. IG INTERNAL GRINDER
No. 34 VERTICAL SPINDLE SURFACE GRINDER
No. 1½ HAND FEED SURFACE GRINDER
No. 3B AUTOMATIC FEED SURFACE GRINDER
No. B-11 PLAIN MILLING MACHINE

Look for Our Full Page Advertisements

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin —also circulars on Drill pointers. Point Thinners, Mill cutter Grinders and Tap Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

CARLTON RADIAL DRILL

FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

"Anti-friction Bearings Throughout"

The **CARLTON**
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

Many of today's Machine Shops are going to need their "faces lifted" for tomorrow's jobs

NOT only because their machines have grown prematurely old due to the strenuous years of war work but also because these shops will have to cope with new materials—new methods and techniques.

Rejuvenation of some of these machines may be effected by re-building—but this will only partially solve the problem—most of the shops will need the newly developed machines so as to keep in step with the coming competitive future era.

In 95 years of PRECISIONEERING on fine machine tools, Sellers engineers have encountered a thousand-and-one problems in design—problems which involve ways and means of doing the job in question better, faster, cheaper. This vast fund of knowledge is available now to those industrialists who realize that only the *modern* plant can hope to meet the challenge of post-war competition . . . Glad to consult with your engineers on this highly important subject . . . Wm. Sellers & Company, 1610 Hamilton St., Philadelphia, U. S. A.

SELLERS PRECISIONEERING SINCE 1848

THERE'S
NO "BEEF" SHORTAGE
BEHIND THESE
CARBIDE TIPS!

CAL-CUTTERS, the new carbide-tipped milling tools, are heavily built, with plenty of "beef" behind each husky carbide tip!

They have the strength and stamina for continuous operation at high cutting speeds and table feeds, produce exceptional surface finishes and high output on STEEL, Cast Iron, Dural, Aluminum, etc.

If you have experienced trouble milling steel with carbides, try Cal-Cutters and forget your worries! By employing proper speeds and feeds obtainable on standard, up-to-date milling machines, Cal-Cutters are licking steel cutting problems, multiplying output, saving down-time for tool sharpening, and greatly lowering cost-per-piece!

Catalog 381-A —just off the press—supersedes our previous catalog and gives the latest information on Cal-Cutter sizes, types and design features for milling a wide variety of ferrous and non-ferrous materials. A copy should be in your file—send for it today. No obligation at all.

MACHINERY MANUFACTURING COMPANY
1915 EAST 51st STREET • LOS ANGELES 11, CALIFORNIA
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS

Grand Rapids

DRILL AND TAP GRINDERS

Model 10-B

Other Combinations Also Available

Sharpens Taps, 2, 3 and 4 Flute, Right or Left Hand. Sizes No. 6 to one and one half inches.

Sharpens Drills, 2 and 3 Flute, Straight or Taper Shank. Sizes from one eighth to one and one half inches.

GALLMEYER & LIVINGSTON CO.
330 Straight Ave. S.W.
GRAND RAPIDS MICH.

ROCKFORD MACHINE TOOL CO.
Hy-Draulic
Shapers . . Planers . . Slotters . . Shaper-Planers
— ROCKFORD, ILLINOIS, U. S. A. —

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STEVENS MILLING MACHINE VISES
5 in., 6 in. and 7 in. sizes
All parts Interchangeable
JOHN B. STEVENS INC.
474 Canal St., New York 13, N. Y.

MILLHOLLAND

Automatic DRILLING - BORING MILLING - TAPPING Units

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

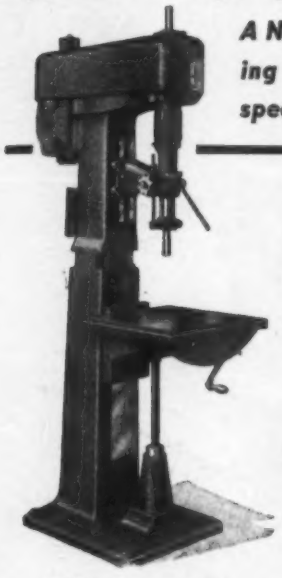
W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

Compact in design—sturdily constructed—foolproof in operation—this powerful DeWalt will *speed up* your cut-off operations not only in today's emergency but long after the war is over. Write for descriptive literature.

DE WALT
PRODUCTS CORPORATION
LANCASTER, PA.

REED VARIABLE SPEED SENSITIVE DRILLS

Type 50 — High Speed — Full Ball Bearing



A New Streamlined Design assuring greater efficiency, accuracy, speed and safety.

These machines—available in from 1 to 6 spindles—are ideal for high speed, precision drilling requirements. They assure the famed Reed "Sensitive Drill" quality so essential to the accurate work they are specially designed to handle.

Features include an instant adjustment of spindle speeds from 440 to 3000 R.P.M. A conveniently located, easily read indicator is provided for showing spindle speed. All moving parts except drill chuck itself are covered, thereby assuring maximum safety and protection.

In multiple spindle models, a variable speed drive is provided with individual motor for each spindle.

SPECIFICATIONS

Capacity ¾" Morse Taper No. 2
Spindle Travel—6"
Adjustment of Head—6½"
Diameter of Spindle—⅞"
Table Working Surface—15⅜" x 16"
Motor—¾ HP

Write for complete specifications.

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

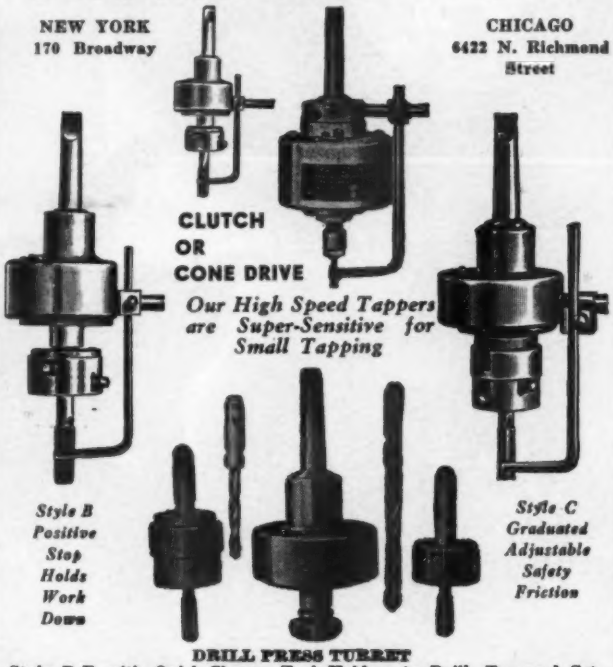
ERRINGTON

Main Office and Works, Stapleton, Staten Island, N. Y.

TAPPING CHUCKS

NEW YORK
170 Broadway

CHICAGO
6422 N. Richmond Street



CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

Style B Positive Stop Holds Work Down

Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustments in each tap-holder. If required. Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

SMITH & MILLS
CRANK SHAPERS

sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio

KNIGHT — VERSATILE · ACCURATE · RIGID · MILLERS

FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE

W. B. KNIGHT MACHINERY CO.
ST. LOUIS MISSOURI

LELAND-GIFFORD COMPANY · WORCESTER MASS. U.S.A. · MACHINE TOOLS · CRANK SHAFTS

Drilling and Tapping Machines

(Automatic and Semi-Automatic)

LELAND GIFFORD CO.
WORCESTER, MASS.

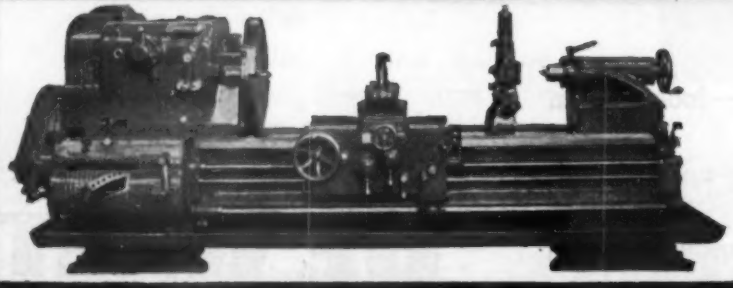
LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

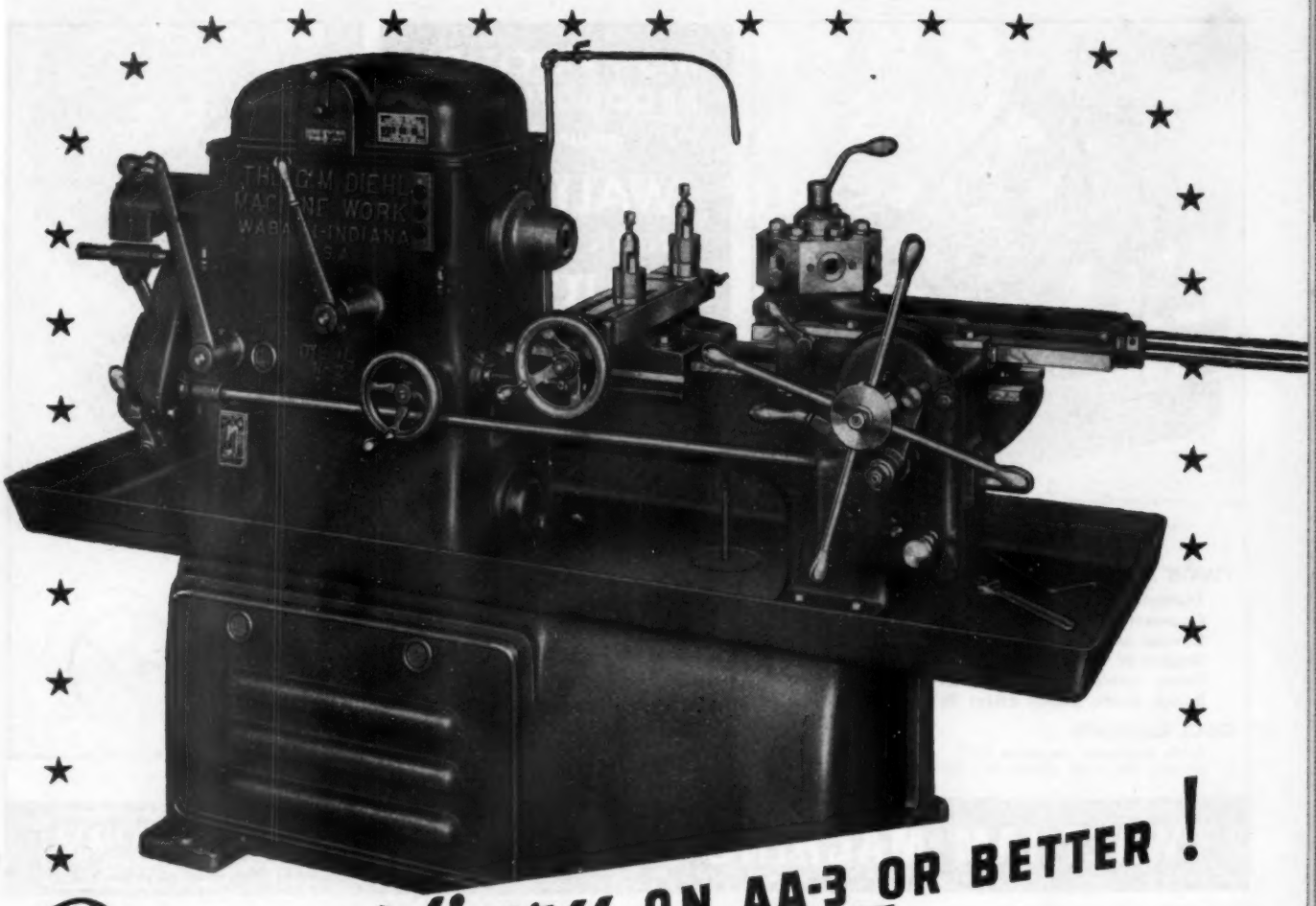
SPRINGFIELD GEARED HEAD LATHES



for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes—flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.



2 weeks delivery ON AA-3 OR BETTER !

Prompt delivery of Diehl No. 2 Turret Lathes can be made on ratings of AA-3 or better. This means prompt replacement of worn out lathes, or production lines can be enlarged without delay. For the Diehl No. 2 Lathe works alongside other No. 2 lathes of standard make, using same tooling, including collets. Embodying the most advanced developments, the Diehl Lathe is unsurpassed for sustained, high speed, precision performance. For replacement or additions, Diehl is a natural.

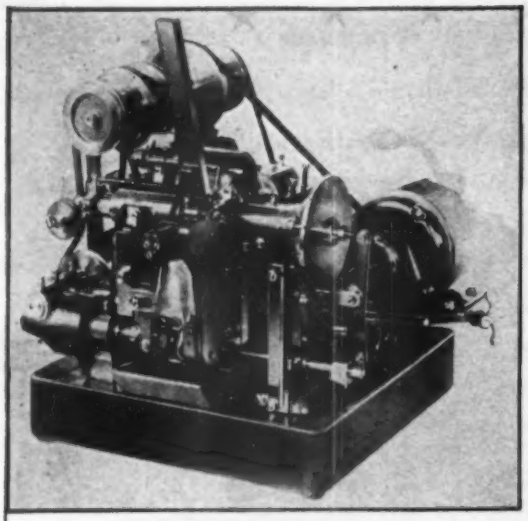
Automatic chuck capacity (round)	**1″**
Swing-over cross slide	**6″**
Swing-over bed	**14″**
Six speeds	**forward and reverse.**

WRITE FOR COMPLETE SPECIFICATIONS AND ILLUSTRATED BROCHURE

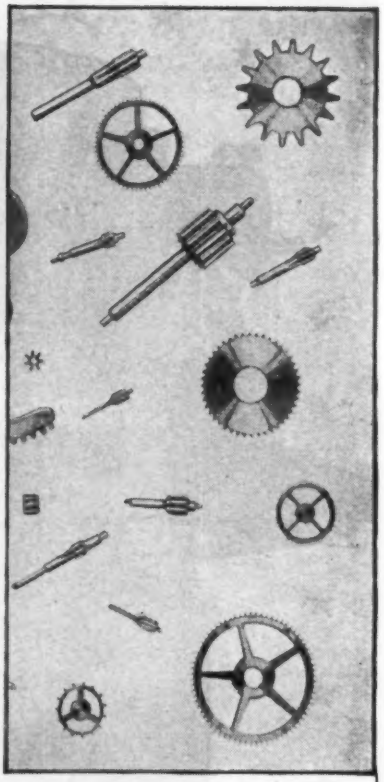
The G. M. **DIEHL** *Machine Works, Inc.*

WABASH, INDIANA

Where precision craftmanship is honored



HIGH PRECISION PRODUCTION . . .
assured by
WALTHAM
PINION AND GEAR
CUTTERS



SPECIFICATIONS

PINION MACHINES

Diameter capacity (approx.) — ½".
Coarsest pitch (about) 32 D.P.
Strokes of work slide for pinions .25" to .45".
Strokes of work slide for stacked gears .85" to 1".
Bench space (countershaft drive) 19" x 18".
Bench space (motor drive) 26" x 25".

GEAR MACHINES

Pitch diameter, capacity 1½".
Strokes for work slide: .40", .65", 1.00", 1.25".

Small parts are cut to tool room standards of precision on these WALTHAM machines which are available in single-cut, multiple-cut and magazine-feed types. The typical parts for watches, meters, time fuses, instruments, gauges, etc., shown here give an idea of the wide range of parts which can be cut to high precision on Waltham machines.

As in all Waltham machines, a revolving cutter makes successive cuts held and indexed by work spindle. Operation is extremely simple and no special skill is required to cut pinions and gears to rigid specifications.

Send at once for complete details.

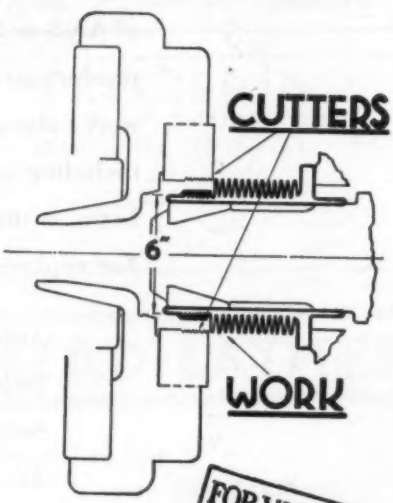
WALTHAM MACHINE WORKS WALTHAM MASS. WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

PLANATHREADING

HALL PLANETARY PATENTED MILLER

Milling the thread on airplane cylinder sleeves! This thread and pilot diameter must be held in true relationship and size. They are so held by Planathreading.

THE TIME IS SIX MINUTES



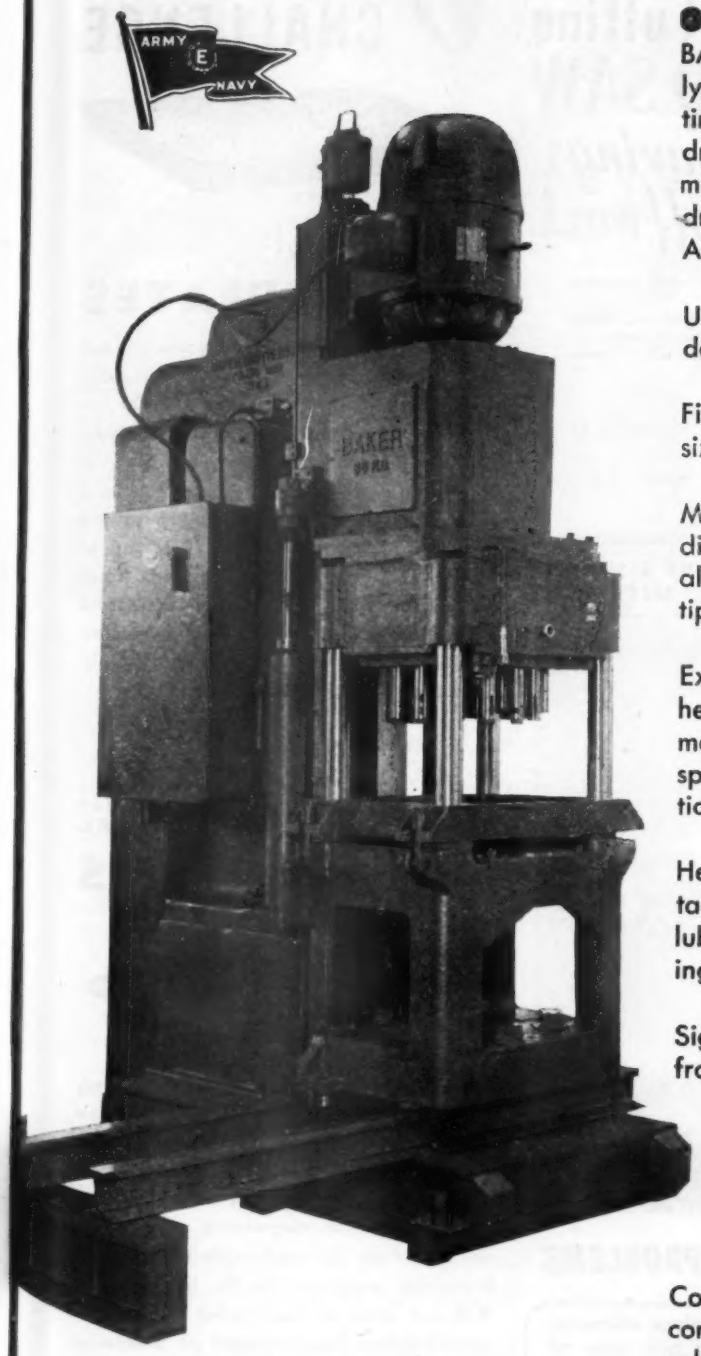
Let Planathreading do your accurate threading operations.

The
HALL PLANETARY CO.
Fox St. & Abbotsford Ave.
PHILADELPHIA, PA.

MODEL 36-HO

A Vertical Hydraulic Feed Machine for

MULTIPLE SPINDLE OPERATIONS



● Here again is a standard BAKER Drilling Machine, specially adapted to an important war time job . . . in this case, multiple-drilling operations in tank transmission cases. The unit, as shown, drills 29 holes in one operation. Among the special features are:

Unique slide-over type fixture . . . designed by BAKER engineers.

Fixture to allow chucking large-size case casting.

Multiple head with four large diameter pilot bars for accurate alignment and location of multiple head and fixture.

Extra-heavy-duty multiple spindle head furnished with spindles mounted on ball bearings; all spindle ends furnished with vertical adjustment sleeves.

Head furnished with self-contained lubricant pump to insure lubrication to all gears and bearings.

Sight feed leveling gauge on front of multiple head.

All of these features contribute to this and other BAKER machine's ability to meet needs for highly productive, continuous service. Consult BAKER BROS. today for competent engineering aid in solving your drilling, boring and tapping problems.

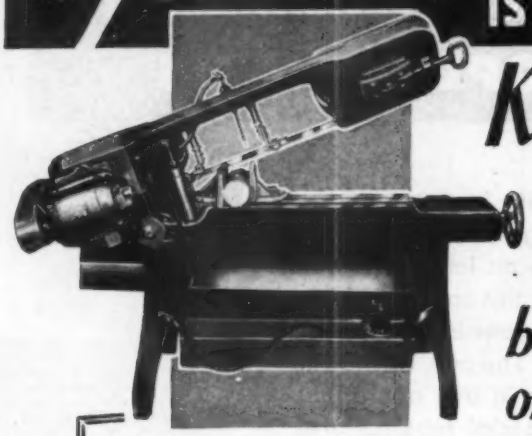
BAKER

BAKER BROTHERS, INC. • Toledo, Ohio, U.S.A.

DRILLING • BORING • TAPPING

Our Motto Since 1867: "Machines Sturdy and Efficient, as Fine as Can Be Built..."

Faster—as Cutting Action is Continuous!



Kalamazoo Metal Cutting BAND SAW brings Savings on Cut-off work

Why use a large expensive cut-off machine when a small low cost machine does the work faster and more accurately?

PAYS FOR ITSELF in a relatively short period due to—reduced labor cost—smaller first cost—lower maintenance, depreciation and power costs.

Portable—wheel it right to the work—plugs in anywhere. Cuts solids, tubes or irregular shapes.

STANDARD MODEL for dry cutting.

COOLANT MODEL for production cutting.

COOLANT attachment is compact—does not interfere with portability or machine operation—lengthens life of saws and triples production.

Plan Now for after-the-war efficiency. Saving in thousands of modern plants.

WRITE FOR BULLETIN.

MACHINE TOOL DIVISION KALAMAZOO TANK & SILO CO. KALAMAZOO, MICHIGAN

PUTTING A NEW "HEX" ON PRODUCTION PROBLEMS

The ROL-TOP "hex" nut is a new application of the Boots principle of self-locking nuts which assure vibration-proof connections.

Because of the recognized efficiency of the ROL-TOP, design engineers are specifying it for application wherever self-locking devices are desirable.

Specially planned and built for heavy duty, the ROL-TOP Nut resists heat, air, gasoline and other destructive elements which make ordinary non-metallic devices inapplicable.

Boots one-piece, all-metal, self-locking nuts pass all government requirements.

SEND FOR CATALOGUE

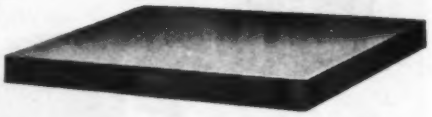
BOOTS

BOOTS AIRCRAFT NUT CORPORATION ★ GENERAL OFFICES, NEW CANAAN, CONNECTICUT

BE ACCURATE

Accuracy wins wars—on the battle front and on production front. Promote positive precision with Challenge equipment!

USE CHALLENGE



Semi-Steel BENCH PLATES

These plates provide an accurate surface for assembly, layout and inspection, and tool room operations—particularly on small parts. Made of special analysis semi-steel with all sides machined at right angles to the top. Two, four, and six inches thick. Standard sizes in the two-inch plates range from 8x10 up to 36x84 inches. Four-inch plates from 12x12 to 48x72 inches; six-inch, from 12x12 to 54x144 inches. Either precision ground (up to 36x96-in.) or planer finish. Special and larger sizes to order.

• • •

CHALLENGE SEMI-STEEL SURFACE PLATES

Provide a true surface for tool making, inspection, and testing purposes, also reliable master plates. Challenge Surface Plates are made of strong, close-grained semi-steel, specially heat-treated. They have three-point suspension and heavy, deep ribs on the underside which form triangular supports for the top surface. Will not give or sag under load. Furnished either hand-scraped or precision ground. Felt-lined wooden protective cover supplied with each plate. 439

THE CHALLENGE MACHINERY CO.

1893 50TH ANNIVERSARY 1943

GRAND HAVEN, MICH., U.S.A.

★ Speed is the watchword for wartime production.
For every minute saved on a part may mean lives saved—
and a shorter war.

Production speed will be a vital factor in the post-war industrial world, also. Who will be *first* to win the post-war market? The plant that is geared to meet competition with low production costs!

Here at Acme our staff of consulting engineers can help you with your production problems, both today and after the war. You may need new dies, patterns, heat-treated aluminum castings. You may need special tools, which Acme can design and build. Recommendations of Acme engineers are available upon request.

Acme has helped many metal-working manufacturers to "make it *faster.*" You incur no obligation in finding out what Acme can do for you.

FOR VICTORY
BUY
WAR BONDS
AND STAMPS

Army-Navy "E" Award received Jan. 12, 1943. White Star for continued high production achievement received Oct. 30, 1943.

ACME *Pattern and Tool Company, Inc.*

DAYTON, OHIO

HEAT-TREATED ALUMINUM CASTINGS—PATTERNS—TOOLS—TOOL DESIGNING—PRODUCTION PROCESSING

Tools Are Weapons—Keep 'em Sharp

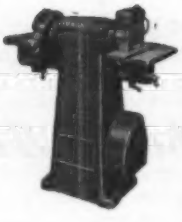
Hammond
OF KALAMAZOO

10" and 14" No Spray, No Splash CARBIDE TOOL GRINDERS

Tools are weapons. Treat 'em right—keep 'em sharp and do it faster with HAMMOND 10" and 14" wet grinders. Wet grinding of carbide tools minimizes cracking . . . eliminates dust hazard. No time lost waiting for tools to cool. Write for new bulletin 206.

WRITE FOR
BULLETIN 206
(JUST OFF THE PRESS)

HAMMOND CHIP-BREAKER GRINDERS for 4" or 6" wheels also Heavy Duty Type



HAMMOND 10" Wet-or-Dri Carbide Tool Grinder Model D-10 Shown

HAMMOND 7" Carbide Grinder for Finish Grinding

Hammond Machinery Builders INC.
KALAMAZOO 54F, MICHIGAN
1618 DOUGLAS AVENUE
Eastern Branch—71 West 23rd Street, New York 10, N. Y.

Now You Can Get IMMEDIATE DELIVERY

THE ability of your plan to meet today's production demands depends to a great extent on keeping tools and cutters in A-1 shape. Covel No. 22 Universal Cutter and Tool Grinder is swiftly solving tool and cutter grinding problems in scores of plants—enabling tool rooms to keep pace with production-line demands.

COVEL No. 22

Universal Cutter and Tool Grinder

FEATURES

- Heavy, Rugged Box Type Bed
- All Controls Handy to Operator
- Sensitive Control
- Cartridge-Type Spindle
- Complete Dust Protection
- Quick Alignment of Attachments
- Hardened Anti-Friction Ways
- Swing-Type Adjustable Micrometer Stop
- Large Assortment of Attachments

For detailed specifications on the fast, flexible Covel No. 22 Universal Cutter and Tool Grinder, write, wire or phone today for Bulletin A-34 and name of nearest dealer.

Cutter and Tool Grinders have had especially hard service during the past three years. Now is the time to determine replacement needs. Covel can meet your requirements with IMMEDIATE DELIVERY on the famous No. 22.

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

"FIT FOR DUTY"

● Only first-class cutting tools can turn work out fast enough — and accurately enough — to be rated as "fit for duty" on today's vital production line!

Tools are weapons Treat 'em Right

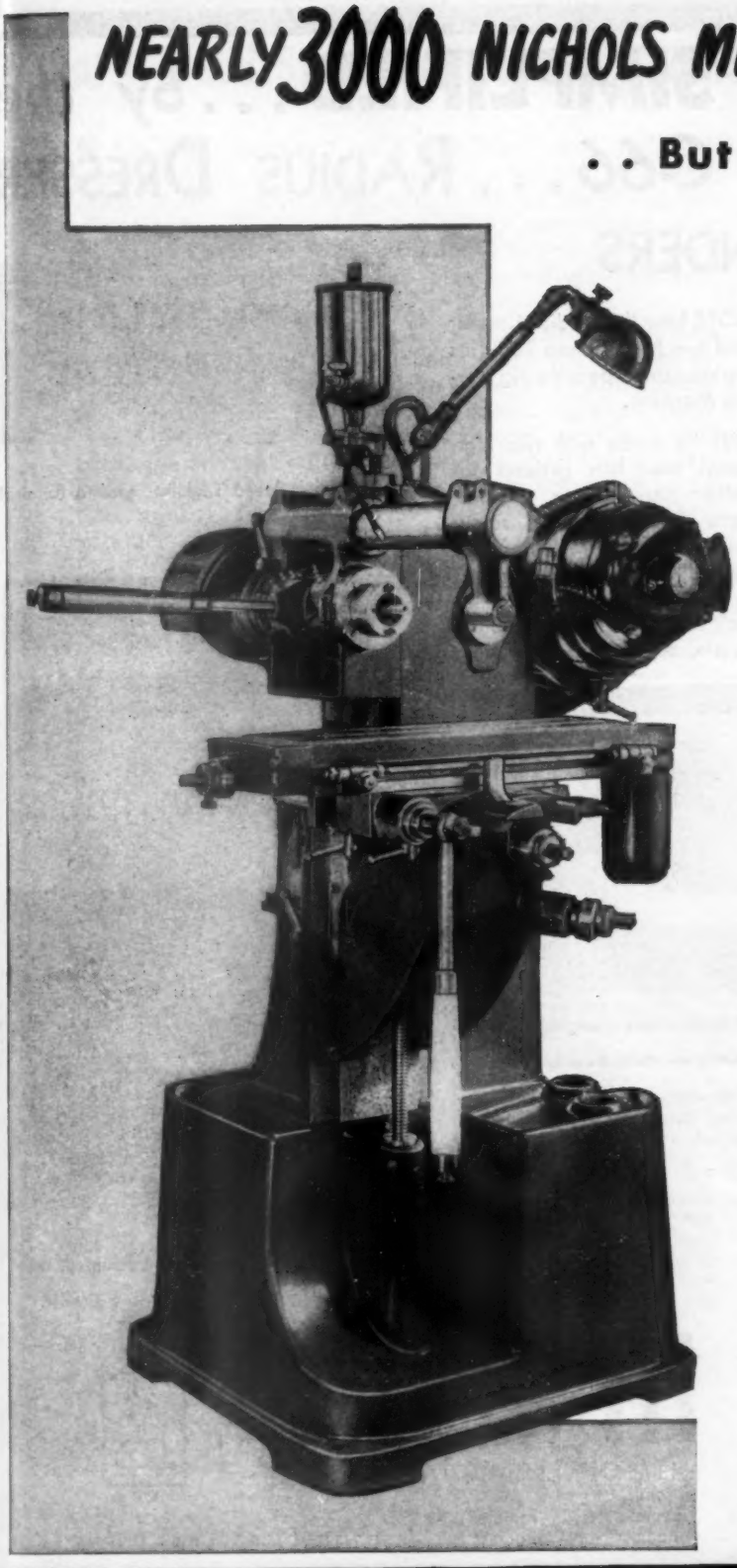
MORSE THERE *IS* A DIFFERENCE **TWIST DRILL AND MACHINE COMPANY**

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

NEARLY 3000 NICHOLS MILLERS IN SERVICE

. . But Not One Full-Time Field Service Man Required!



This outstanding record results from uncompromising quality and correct design.

Toolroom Accuracy
Unrivaled Flexibility
Low Cost

explain why the NICHOLS Miller is a recognized leader for Production, Toolmaking, or Laboratory.

●

Investigate the multitude of unusual operations illustrated in the new 86 page Nichols Handbook. A helpful guide covering Milling — Profiling — Boring — Facing and Grinding. Ask for a free copy!

Range:

Longitudinal — 10"
Transverse — 7"
Vertical-Knee — 13½"
Spindle Rise and Fall — 4½"
Standard Speeds to 2400 RPM
Special Speeds to 5000 RPM

IMMEDIATE DELIVERY

W. H. NICHOLS & SONS
WALTHAM - - MASS.

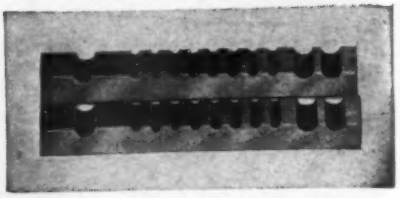
SOLE DISTRIBUTORS
NICHOLS-MORRIS CORPORATION
50 CHURCH STREET, NEW YORK, N. Y.
DEALERS IN ALL PRINCIPAL CITIES

DRESSING IS SIMPLIFIED . . . by the New Time-Saving C-66 . . . RADIUS DRESSER FOR SURFACE GRINDERS

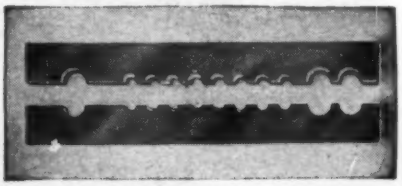
This low-priced, rugged attachment, for any make of surface grinder, dresses wheel without dismantling machine. Mounts directly on magnetic chuck. Does a one-hour job in 10 minutes — accurately — conveniently.

NOTE how this Radius Dresser and two High Speed Tool bits replace an expensive Jig Boring Machine.

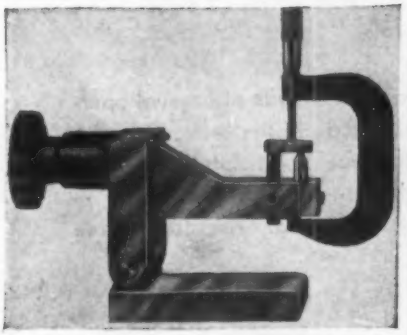
Drill Jig made with two high speed tool bits ground together on surface grinder, eight .062 holes, two screw holes, one dowel pin-hole. No drill bushings, no lapping, no hardening. Grinding time two hours fifteen minutes. Simple, easy, quick.



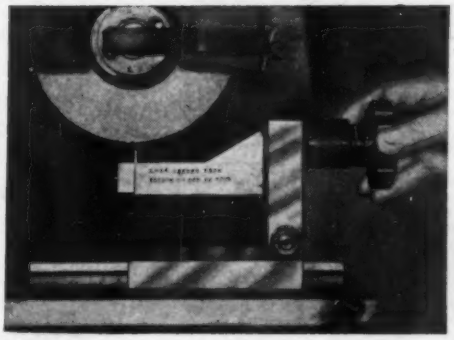
Two High Speed Tool Bits ground for drill jig.



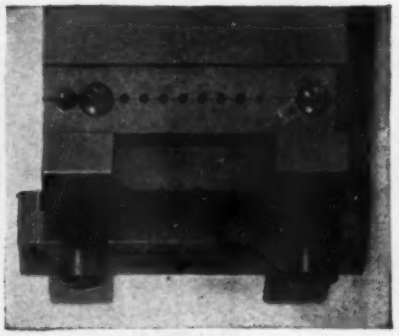
Drill jig completely assembled.



The diamond is set by simply measuring with micrometer from top of hood to bottom of arm.



The C-66 provides an important safety feature in that hands are kept away from under the wheel.



Drill jig completely assembled.

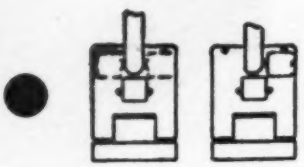
For dressing wheels for grinding turning tools, the dresser is set at angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.

Long Wearing Chisel Point Diamond

The diamond holder is held against a ground vee in the arm. By means of this construction any size diamond up to 3/8" can be held accurately in line with the vertical center line of spindle.

.013 Male and Female Radius

.500 Male and Female Radius



180° and 90° Male Dressing.

Prompt delivery from factory in Newark, N. J. Price, without diamond, $82.50, 1/4 K diamond, $5.00.

SCHULTZ & ANDERSON CO.

MACHINE TOOLS

109 C EDISON PLACE NEWARK, N. J.

Get a Head Start on Postwar Competition, *Right Now!*

● It's true that the Lipe Carbo-Matic was designed especially for high-output war production. In hundreds of war plants, Lipe Carbo-Matics are "hogging off" tough armament steels with an ease, speed and precision that's truly remarkable. They're doing proportionately faster and finer jobs on softer steels and on non-ferrous metals.

But when D-day arrives . . . when cost competition is resumed once more . . . that's when the owners of Lipe Carbo-Matics are going to recognize a completely new set of values in these high-speed, high-precision lathes. For that's when savings in tool wear and tool breakage are really going to show up. And that's when reduced scrap losses and fewer rejects are going to be determining factors in the price of your finished products, and in the market which they enjoy.

LIPE-Rollway Corporation
Syracuse, N. Y.

Plan to Replace
Aged and Worn-out Lathes with Modern High-Speed
LIPE CARBO-MATICS

Thousands of worn-out and overaged tools are going to be scrapped and replaced after the war. Plan now to be at the head of the list when postwar shipments start. Get a head start on competition by being first with production economies.

LIPE *Carbo-Matic* **LATHE**

By the Army, the Marines and the Navy, too

SHELDON Precision Lathes have been selected by the Army for its Mobile Machine-Shop Units, by the Marine Corps for its trailerized shops and by the Navy as the ideal lathes for several types of repair shop aboard ship and ashore.

SHELDON Lathes are also widely used in British, Canadian, South African, Russian and other allied factories to speed the production and maintenance of war material . . . proof of worldwide SHELDON accuracy and dependability.

SHELDON 10" (1-inch collet capacity) Precision Lathe and Bench Unit with E-type underneath motor drive.

SHELDON

SHELDON MACHINE CO., INC., 4234 N. KNOX AVE., CHICAGO 41, U.S.A.

6 HOLES in Propeller Blade Bushing *held to* CCURACY *of* ±.0005" *with* HIGH FINISH

dimensions in
g the 36 high-
in these Bronze
ade Bushings
±.0005".

STOKERUNIT SIMPLEX PRECISION BORING MACHINE

Precision Bores Each Hole in 16 Seconds

A widely known manufacturer of airplane propeller parts is regularly using a battery of Stokerunit Simplex Precision Boring Machines to insure superior finish and precision accuracy in critical boring operations.

In the production of these alloy bronze propeller blade bushings, for example, an extremely fine finish with close tolerances is required in finish boring the 36 holes in the flange. All dimensions—roundness of hole, dimensions between holes and distance from center of bushing—are uniformly held to ±.0005".

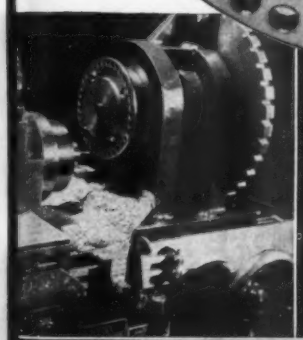
PRECISION ACCURACY AND FINE FINISH MAINTAINED IN PRODUCTION

In this setup, the Stokerunit Simplex Precision Boring Machine bores one hole at a time every 16 seconds in alloy bronze bushings — hardness 90-100 Rockwell. Hole is .3125" in dia. ±.0005" by 1/4" deep. Work slide is equipped with constant reciprocating feed, and indexing is done by hand when work is clear of tool. Feed is 4 7/8" per minute; spindle speed 1750 r.p.m. Every rigid requirement of accuracy and finish is consistently maintained.

VERSATILITY — Stokerunit Simplex Precision Boring Machines can be adapted to a multiplicity of precision boring operations — for either short-run or production work. They can be furnished with single or multiple spindles, depending upon your requirements. Over 25 models are available in both mechanical and hydraulic feeds and cover practically the entire range of precision boring applications.

Profit with precision accuracy, finer finish and increased production in your precision boring operations. Consult our engineers for a study of your parts and production problems.

For specific recommendations, send blueprints of parts with production requirements. No obligation.



(Left) One hole at a time is precision bored every 16 seconds.

(Right) The Simplex maintains precision accuracy and fine finish in production.

(Below) Partial view of battery of Stokerunit Simplex Precision Boring M chines in plant producing airplane propeller parts.

BULLETINS with Complete Data!

Write today for these two booklets covering our entire line of Simplex Precision Boring Machines. Full details and specifications of each type are included.

STOKERUNIT CORPORATION

IGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES

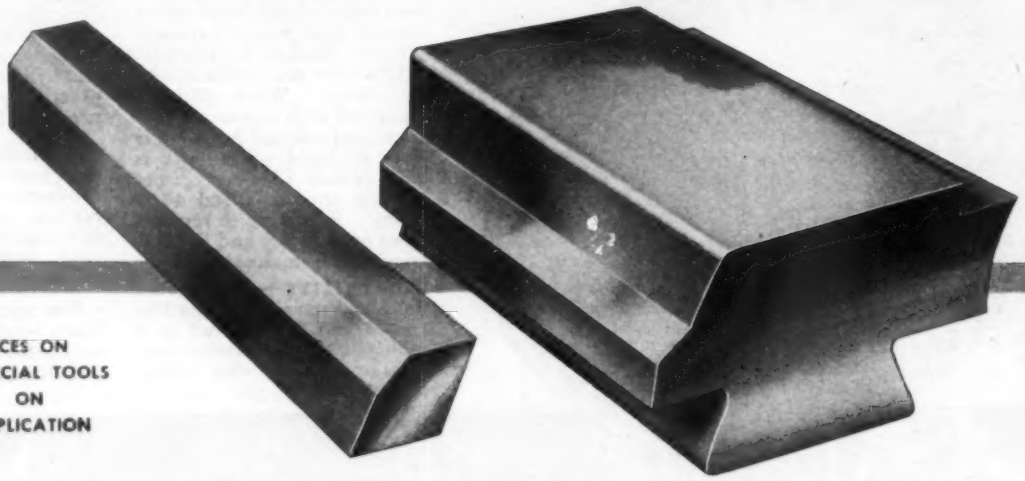
4524 WEST MITCHELL STREET · MILWAUKEE, WISCONSIN

SPECIAL

FINISH GROUND
HIGH SPEED STEEL

FORMING TOOLS

FOR PRODUCTION JOBS



PRICES ON SPECIAL TOOLS ON APPLICATION

and a full line of . . .

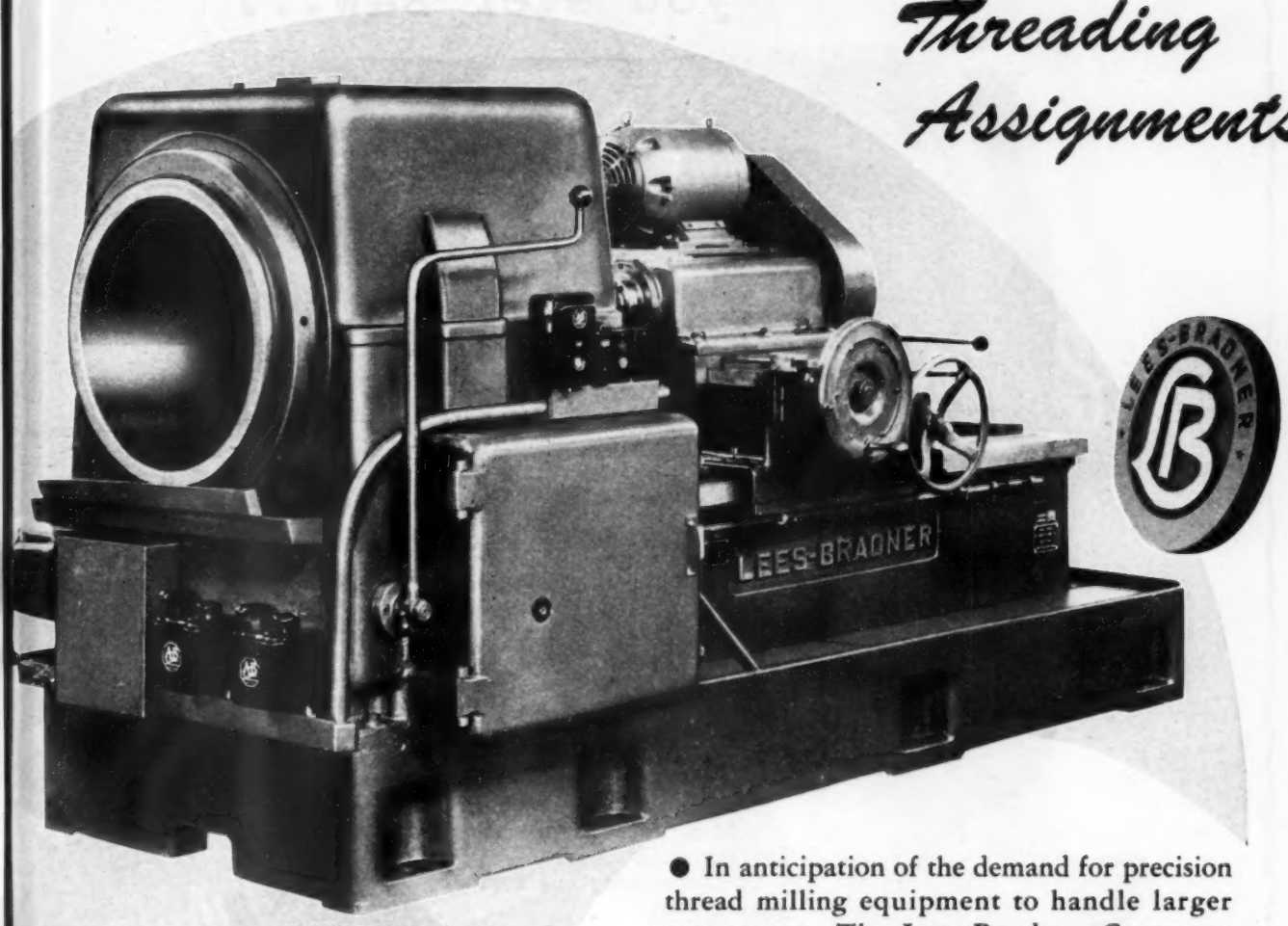
STANDARD SQUARE AND RECTANGULAR TOOL BITS *and* TURNING TOOLS

CATALOG UPON REQUEST

GORHAM TOOL COMPANY

14400 WOODROW WILSON • DETROIT 3, MICHIGAN

To Handle Large Sized Precision Threading Assignments



LEES-BRADNER *Announces* THE NEW MODEL SCT HEAVY DUTY CHUCKING THREAD MILLER

● In anticipation of the demand for precision thread milling equipment to handle larger components The Lees-Bradner Company developed the new Model S C T Heavy Duty Chucking Thread Miller.

This new, precision tool is supplied with a 22″ bore through the workspindle, a Timken mounted cutter spindle, individual motor drives for the cutter and work spindles, centralized controls, and high speed rapid traverse. One piece bed and pan construction, extremely wide way sections, the liberal use of antifriction bearings, the employment of rugged short drives throughout, and heavy-section castings yield a new heavy duty tool ideally suited for continuous, gruelling production.

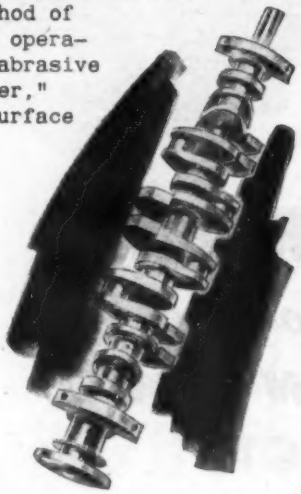
Why not investigate the advantages gained by applying the new Lees-Bradner S C T's capabilities to your heavy duty precision threading requirements?

The LEES-BRADNER *Company*

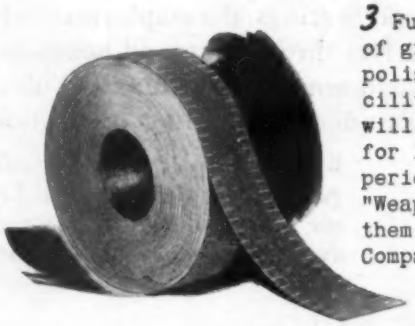
CLEVELAND 11, OHIO, U.S.A.

The darndest machine you ever saw...

1 It has an interesting, complex oscillating motion. It works up and down following crank contours. And it does it all at once! It's the darndest machine you ever saw! Yet it is one of the most efficient and productive machines of its type. Its job is to finish all of the bearing surfaces on a crankshaft at one fell swoop! The older method of performing this same operation is to hold the abrasive cloth in a "nutcracker," finishing only one surface at a time.



2 With the new machine, strips of successively finer grits of abrasive cloth, having serrated edges to permit the strips to follow the fillets of the bearings, are automatically inched past the revolving crankshaft from a feed roll of the cloth. And on many a job it's Aloxite Brand cloth by Carborundum that gives the ultimate smooth, satin finish.



3 Further improvements in techniques of grinding, finishing, sharpening and polishing, developed through the facilities of The Carborundum Company, will be helping to produce still more for less, now as well as in postwar period. Remember abrasive products are "Weapons for Production." Use them wisely. The Carborundum Company, Niagara Falls, N. Y.

CARBORUNDUM
TRADE-MARK
ABRASIVE PRODUCTS

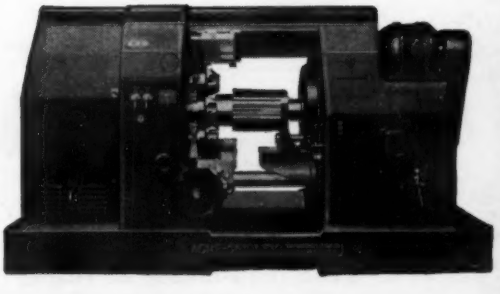
Carborundum and Aloxite are registered trade-marks of and indicate manufacture by The Carborundum Company.

THIS MONTH'S "BEST SELLER" ON THE PRODUCTION LINE

Production men who have chucking work to do can't afford to be without this book—write for Bulletin CM-43, on your letterhead.

★

New Acme-Gridley Chuckers—4, 6 and 8-spindle—are engineered for new production and accuracy—to produce more at lower costs.



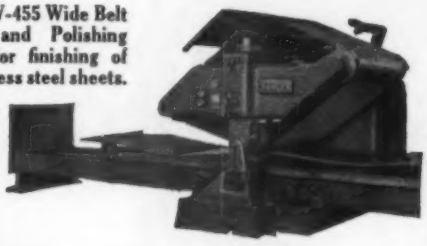
THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

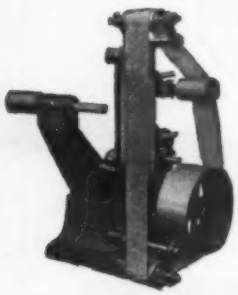
MATTISON
ABRASIVE BELT GRINDING AND POLISHING MACHINES

Mattison W-455 Wide Belt Grinding and Polishing Machine for finishing of wide stainless steel sheets.

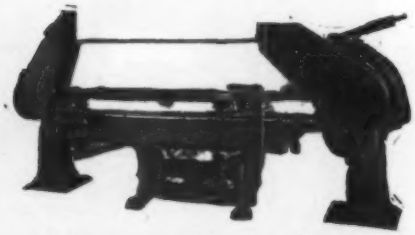


Mattison S-441 Grinding and Polishing Machine for flat and curved work. Can be furnished with or without special fixtures, depending on work ground ➡

Mattison J-135 Backstand Idler adapts regular polishing Jack to the use of factory-coated abrasive belts.



Mattison J-115 Variety Belt Grinding and Polishing Machine for flat and curved surfaces. ⬅



Mattison L-138 Grinding and Polishing Machine arranged for wet grinding.

★ Results obtained in a number of plants definitely establish the use of factory coated abrasive belts as a most efficient practice. Besides reducing the number of rejections and improving the finish, they have cut the polishing cost per piece through increased production.

However, to secure full benefit from factory-coated abrasive belts, the right type of mechanical unit is necessary. The machine is all important for properly applying the abrasive to the particular job to be done.

Mattison Abrasive Belt Grinding and Polishing Machines are engineered with a knowledge of the factors involved to give the best application of belts. From the time factory-coated abrasive belts were introduced for metal grinding and polishing, Mattison's have developed and built machines to provide best results.

Mattison Abrasive Belt Grinding and Polishing Machines are used for smoothing up welding marks, polishing solid parts—such as handwheels, levers, handles, steel sheets including stainless steel—and the inside of tubes. They are built for both the wet and dry grinding method. In addition to the finishing of metal parts, they are used for plastics, hardened rubber, fibre, glass, etc. In fact, the applications are so numerous, only a few can be mentioned and shown on this page.

MATTISON GRINDING MACHINERY

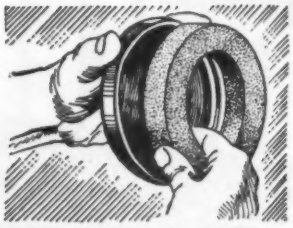
Whatever your problems may be, it is well worth while to make an investigation as to the machine available for handling it.

SEND FOR *FREE* BOOKLET

Illustrates various applications of Mattison Grinding and Polishing Machines, built to secure best results from factory-coated abrasive belts. Also gives helpful data on grinding and polishing metals, plastics and other materials with abrasive belts. Write today for your copy.

MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS

The New STERLING EASYMOUNTS* and WHEELS



● The wheel easily slips into the EASYMOUNT and is as readily removed for quick replacement.

● After placing the wheel in the EASYMOUNT, it is a matter of a moment to tighten the retaining screws and start production.

* Patent applied for.

Important Time and Money-Savers

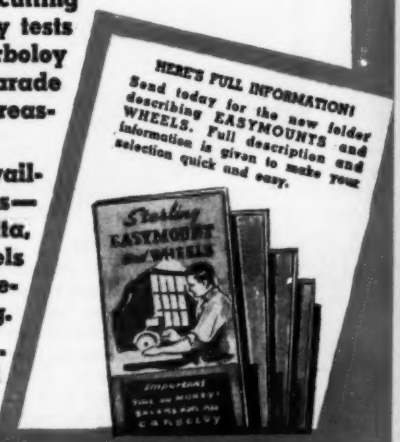
for Carboloy and Tool Grinders

● **Sterling's new EASYMOUNTS and WHEELS are making available extra economy and much saving of time to carboloy grinder users. You purchase the EASYMOUNT once and supply wheels as they are needed. Your first cost for the mount is your last. Once fastened to your grinder the EASYMOUNT stays on. You simply replace worn wheels.**

The rigidity of the EASYMOUNT, plus the results of a new bond for the wheels, imparts better cutting action and provides longer wheel life. Many tests show the new Sterling EASYMOUNT for carboloy grinders is another "hit" in the long Sterling parade of "firsts" in reducing grinding costs and increasing efficiency.

Sterling EASYMOUNTS and WHEELS are available in sizes to fit various types of grinders—Sellers, Heald, Excello, Baldor, Hammond, Delta, Prosser, Critteron, and Norton Buroway. Wheels are supplied in coarse grain for roughing, medium for semifinishing, and fine for finishing.

Try Sterling's EASYMOUNTS and WHEELS . . you will never change! Our engineers will gladly work with you upon request.


HERE'S FULL INFORMATION!
Send today for the new folder describing EASYMOUNTS and WHEELS. Full description and information is given to make your selection quick and easy.
Sterling
EASYMOUNT
and WHEELS

• STERLING ABRASIVES •

THE
STERLING GRINDING WHEEL DIVISION
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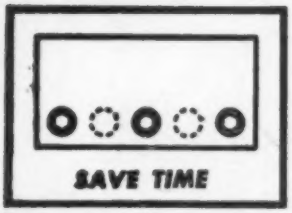
THE WHEELS OF INDUSTRY

Yes, these screws save Time and Space!



No matter how close to a corner or flange you put Mac-it hexagon socket screws, there's plenty of room to drive them. This feature saves space.

* * *

Mac-its are heat-treated to give far greater strength than plain steel screws. With that extra holding power, you may be able to use fewer screws—save drilling and tapping time.

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Production tie-ups because of broken screws are not necessary evils. Chances are that standard Mac-its will solve the problem.

Mac-its

PRONOUNCED "MACK-IT" 4311

OTHER MAC-IT PRODUCTS INCLUDE:

Socket head and hexagon head cap screws, stripper bolts, hollow and square head set screws, hexagon socket pipe plugs.

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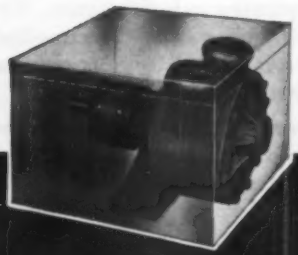

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Some of the metal field cases for 50-caliber ammunition were not standing up to the pressure test when submerged in water. Try as they would, the makers couldn't get rid of this "headache" which occurred in a sufficient number of cases to make the whole operation slow and worrisome.

"Looks like a 'natural' for our waterproof abrasive belts on a wet-sanding machine. Got such a thing?"

They hadn't, but on the recommendation of our engineer were game enough to put one in and equip it with Speed-wet Durite Cloth (waterproof) belts.

Result? ***Not a single failure! And in addition—100% increased output! The four edges met the lid in a perfect leakproof seal.***

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There's a strong possibility of similiar savings to be made on some of *your* operations. We will be glad to make a complete survey.

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Photos, Courtesy of The Belmont Casket Manufacturing Company, Columbus, Ohio.

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They'll stand continuous hour after hour use—three shifts a day—seven days a week. They'll turn out more work—better work—faster and easier, with longer trouble-free operation. Use your Haskins Flexible Shaft Machines—use them hard. They won't let you down. Learn new ways of increasing production with flexible shaft equipment from Catalog 45. Write to R. G. Haskins Company, 2760 W. Flournoy Street, Chicago, Illinois.

HS-7
1 H. P. heavy duty motor,—4-speed countershaft. Mounted on 3-wheel truck.

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Save Drills!

Because they are straight and round and because of their super-finished bores, Universal Drill Bushings last longer—save wear and tear on valuable drills.

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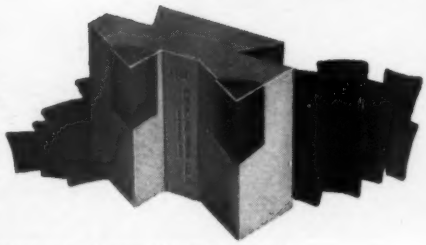

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UNUSUAL?

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Carbide tipped
FORM TOOLS

GET WHAT YOU ASK FOR—EXACTLY

New England carbide tipped form tools must be seen — *and used* — to be appreciated. The generous tips are ground and lapped to specified forms and tolerances — *exactly*. You can be sure of this, because every New England tool is checked and double checked on the most up-to-date optical inspection equipment.

New England Carbide Tool Company is headquarters for the tough jobs. Call on us for quotations on complicated, unusual or special form tools that must be right — *exactly!*

Other special carbide tipped tools manufactured by New England Carbide Tool Company include reamers, centers, boring and skiving tools, drills, counterbores, trepanning tools, etc.

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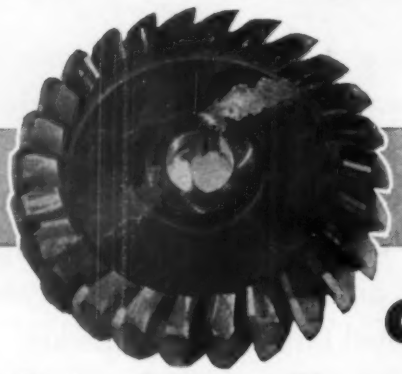
COLD TREATING now permits salvaging of broken cutting tools!



Chilling in Deepfreeze at -120° F., After Brazing Operation, Restores Original Hardness to H.S.S. Formed Cutter...

The 8¾" x 1¼" special formed milling cutter shown above was broken in two in a prominent machine tool manufacturer's plant.* Ordinarily this expensive tool would have been scrapped because welding or brazing would soften the cutting edge. However, this company had previously hardened tool steels by chilling in a Deepfreeze, and thought it possible to restore hardness to the cutting edges of the brazed tool. After a brazing operation and sharpening to its original form, the cutter was chilled at −120° F. for two hours in a Deepfreeze Cascade −120° F. Industrial Chilling Machine. The result was that the original hardness of the teeth at the point of the weld was restored.

Now with this new method of treating welded and brazed cutting tools it is no longer necessary to scrap all broken tools. If it is possible to restore a broken tool to working condition by welding or brazing, cold treating will return the cutting teeth at the point of weld to their original hardness. Thus it is often possible to salvage expensive tools that otherwise would be scrapped. In addition, production delays and costly machine downtime are eliminated.

*Manufacturer's name upon request.

FIND OUT HOW YOU CAN USE A DEEPFREEZE IN YOUR PLANT...

For the complete and latest data on the use of Cold Treatment for metals in industry today, get the new Deepfreeze Metal Chilling Data Book. In this handy working guide on the use of industry's newest production tool you can learn how to use sub-zero temperatures for the shrinking, testing, hardening and stabilization of metals in your plant. A free copy can be obtained by writing Deepfreeze, North Chicago, Illinois. Write today for as many copies as you need.

REMOVES 1000 BTU's PER HOUR AT −120° F. WHEN WORK IS IMMERSED IN CONVECTION LIQUID...

In addition to the application described above, Deepfreeze Industrial Chilling Machines are finding unlimited use in a wide variety of industrial fields. The Deepfreeze Cascade −120° F. Industrial Chilling Machine has a chilling capacity for high production metal chilling of many parts where large quantities of heat must be removed fast.

Let Deepfreeze engineers assist you in obtaining the advantages of cold treating. Send an outline of your problem together with parts or prints for a preliminary analysis or test. There is no obligation.

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Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

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Division of Motor Products Corporation, Detroit, Michigan

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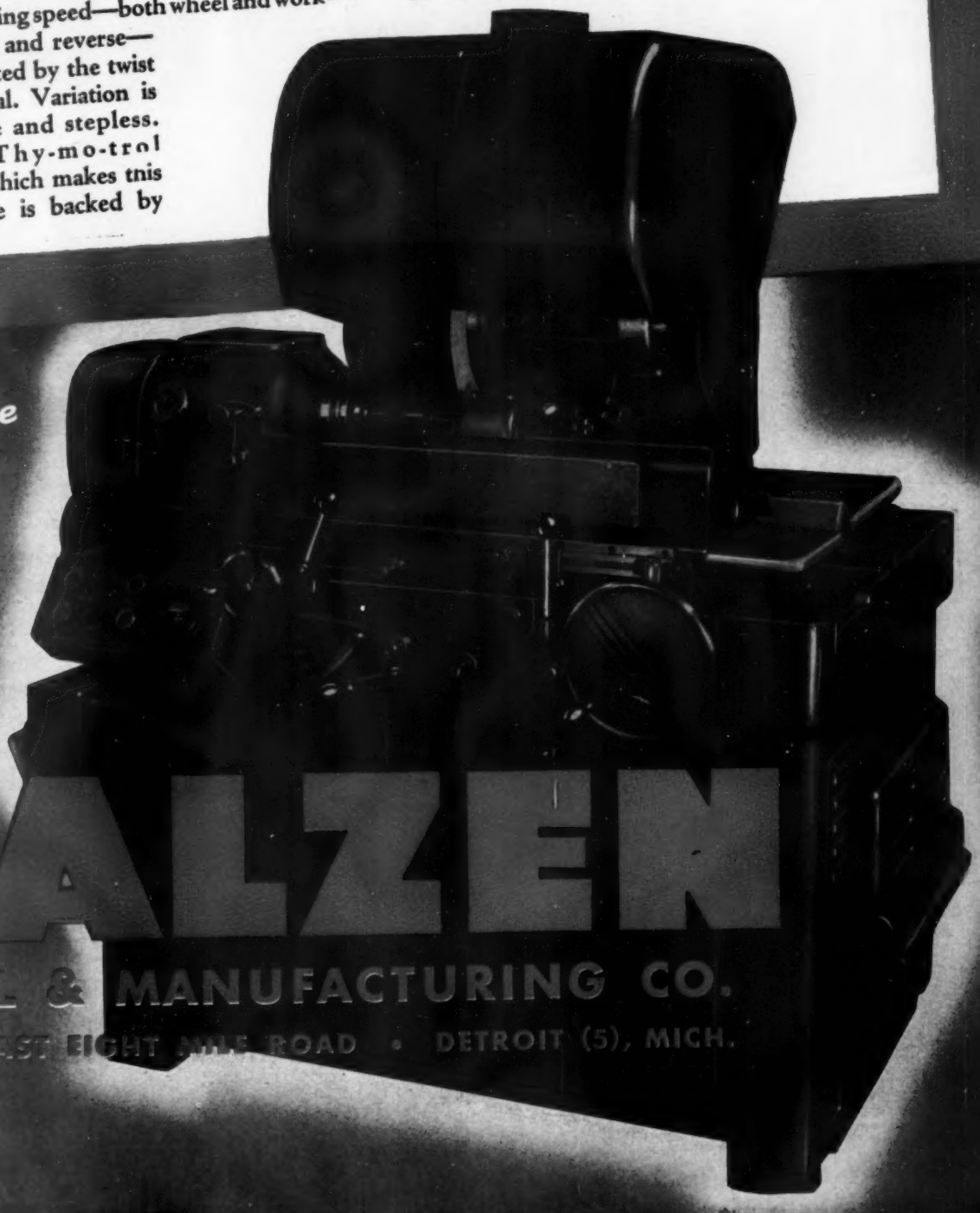
NOW—DALZEN BRINGS ELECTRONICS TO THREAD GRINDING, PROVIDING NEW EFFICIENCY, EASE OF OPERATION, SET-UP, AND COMPLETE CONTROL OF WORK QUALITY

The new Dalzen No. 5 Thread Grinder, with General Electric Thy-mo-trol drive, provides the highest possible production of threaded parts, thread gages, straight and spiral fluted taps, and thread milling cutters. Accuracy and finish are exceptional.

Grinding speed—both wheel and work—forward and reverse—is adjusted by the twist of a dial. Variation is infinite and stepless. The Thy-mo-trol drive which makes this possible is backed by General Electric's own service guarantee.

Full details on this new Dalzen, which makes complete precision thread grinding available to everyone, are given in a striking three-color folder, titled "Dalzen Electronic Thread Grinder." A copy will be sent you, free of charge, on request.



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After 2 months Equal Service in identical machines—Which of these 2 SLEEVES would YOU depend on for ACCURACY?

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Style No. 351—B. & S. Taper Sleeves with B. & S. Holes
Style No. 356—Morse Taper Sleeves with B. & S. Taper Holes
Style No. 358—B. & S. Taper Sleeves with Morse Taper Holes

TAPPED END FOR DRAW BAR
Style No. 352—B. & S. Taper Sleeves with B. & S. Taper Holes
Style No. 359—B. & S. Taper Sleeves with Morse Taper Holes

EXTENSION TYPE
Style No. 354—Morse Taper Extension Sleeves with Morse Taper Holes

THE SLEEVE illustrated on the left is an ordinary soft steel sleeve; the one on the right is a Midwest Hardened and Ground Sleeve. Because Midwest Sleeves are scientifically hardened and precision ground, their length of accurate life is from ten to twenty times longer than ordinary sleeves. The hardened surfaces do not easily mar or chip through handling and use, permanent taper concentricity is maintained. Where these Midwest Sleeves are used in drill presses or milling machines, the tools placed in them are held in accurate alignment. Drill breakages are reduced, spoiled production is avoided.

Furthermore, the conservation of steel and getting the utmost out of cutting tools are highly important matters at the present time. The longer life of Midwest Sleeves saves vital steels—the steels that would otherwise be consumed through repeated identical replacements of soft steel sleeves which quickly become worn, marred and discarded.

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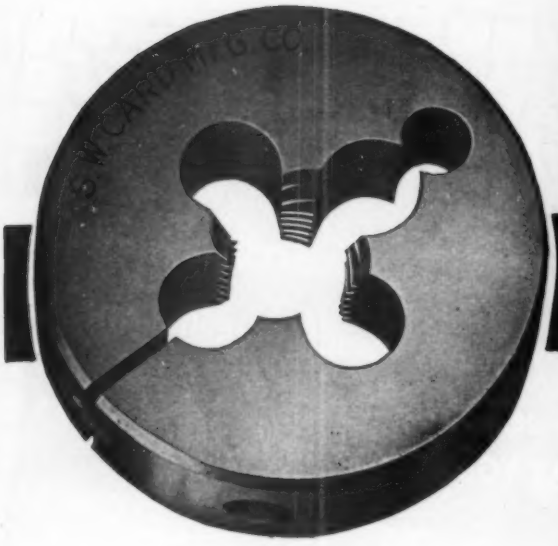

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Stand the gaff of toughest threading demands . . . . . .

CARD DIES ARE AVAILABLE THROUGH LEADING DEALERS

Under today's conditions, when quality must be maintained regardless of quantity demands, it is good to know that CARD DIES can be depended on for production threading.

The CARD line includes Spring Screw Threading Dies of carbon steel in machine screw and fractional sizes, Adjustable Round Split Dies for both hand and screw machine work in machine screw, fractional, and pipe sizes.

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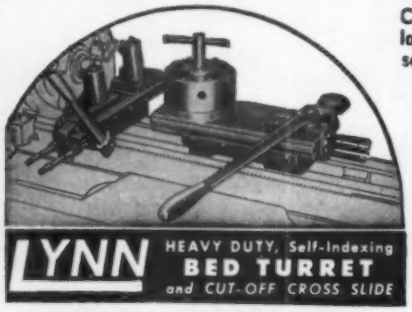

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Convert your bench lathes for precision screw-machine work—with this rigid, sturdy unit. SPEED production with unskilled help. 6" head, 5½" turret travel; fits standard bench lathes up to 13" swing. Handles 6 tools. Also cut-off cross slide and LYNN Tool Post Turret for lathes with 12" to 28" swing.

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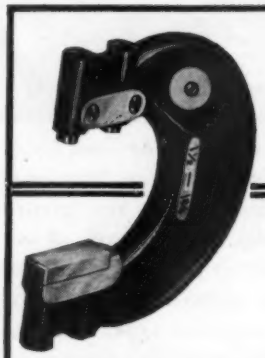

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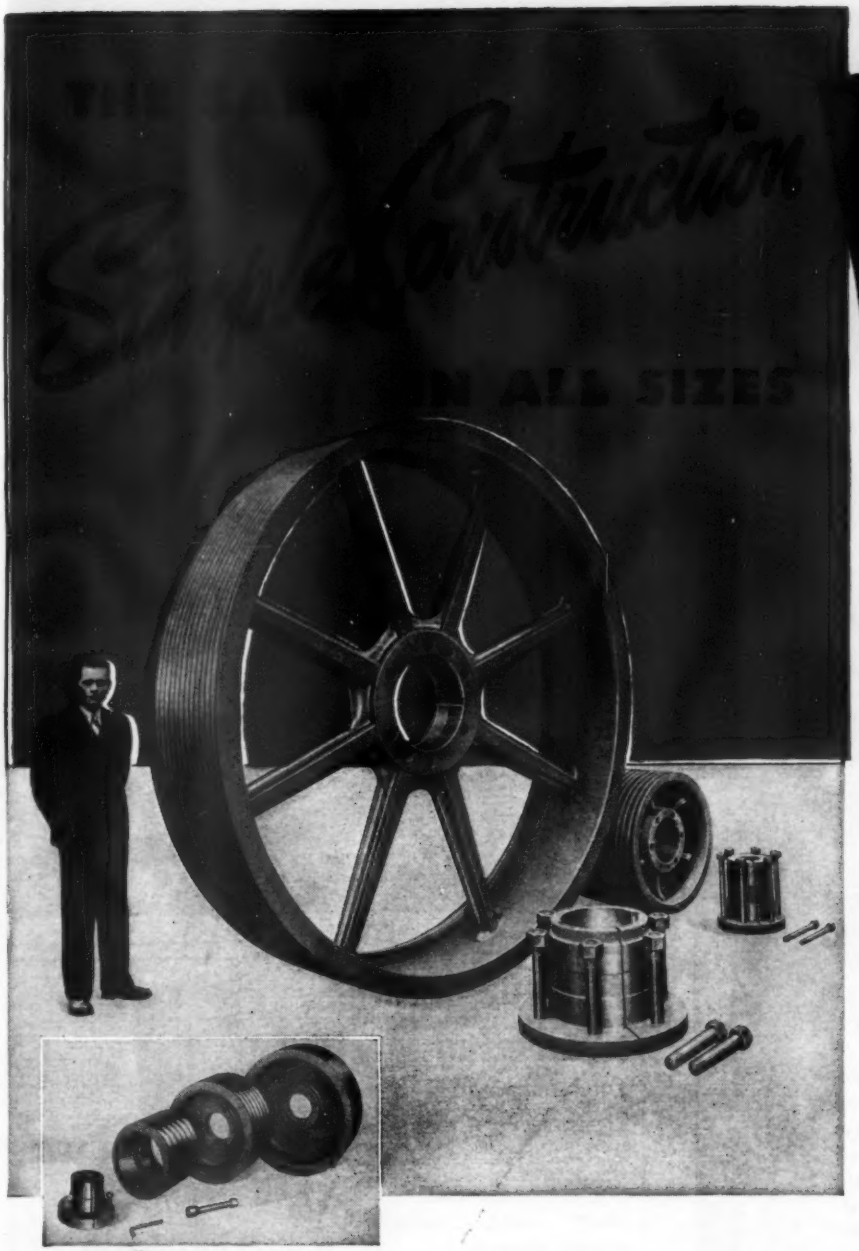

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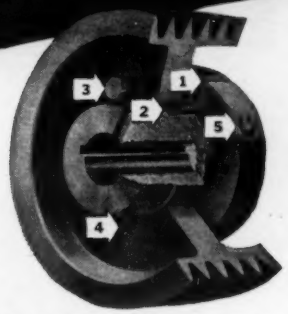

1 Split hub for easy mounting or removal from shaft.

2 Tapered fit between hub and rim for easy mounting or removal of rim from hub.

3 Pull-up bolts for tighter fit of rim on hub.

4 Tapped holes in rim in which bolts act as jack screws for easy removal of rim from hub.

5 Cap screw holds hub in position on the shaft when mounting or changing sheave rim.

WORTHINGTON
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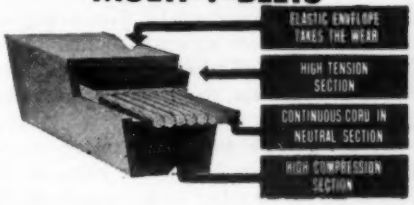
EC CORD
MULTI-V-BELTS



ADD the extra advantages of Worthington QD Sheaves to the well-known superiority of Goodyear EC Cord Belts, and it becomes apparent why machine designers, engineers, foremen, and mechanics from coast to coast are enthusiastic about Worthington Multi-V-Drives.

QD ("Quick Detachable") Sheaves — with split hub and tapered fit — can be put on or taken off . . . by a man (or a woman) and a wrench. . . in 60 seconds. Tapered friction drive and positive press fit. Vari-sized rims fit same hub.

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For further information, write or call the Worthington Multi-V-Drive dealer or the nearest Worthington district office in your territory.

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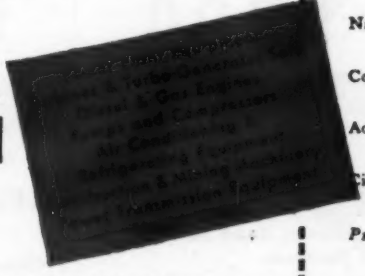

Standard Products Division
Worthington Pump and Machinery Corporation
Harrison, N. J.

Please send me literature describing in detail the advantages of Worthington Multi-V-Drives, with QD Sheaves.

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MV 4-1

WORTHINGTON PUMP AND MACHINERY CORPORATION, HARRISON, N. J.

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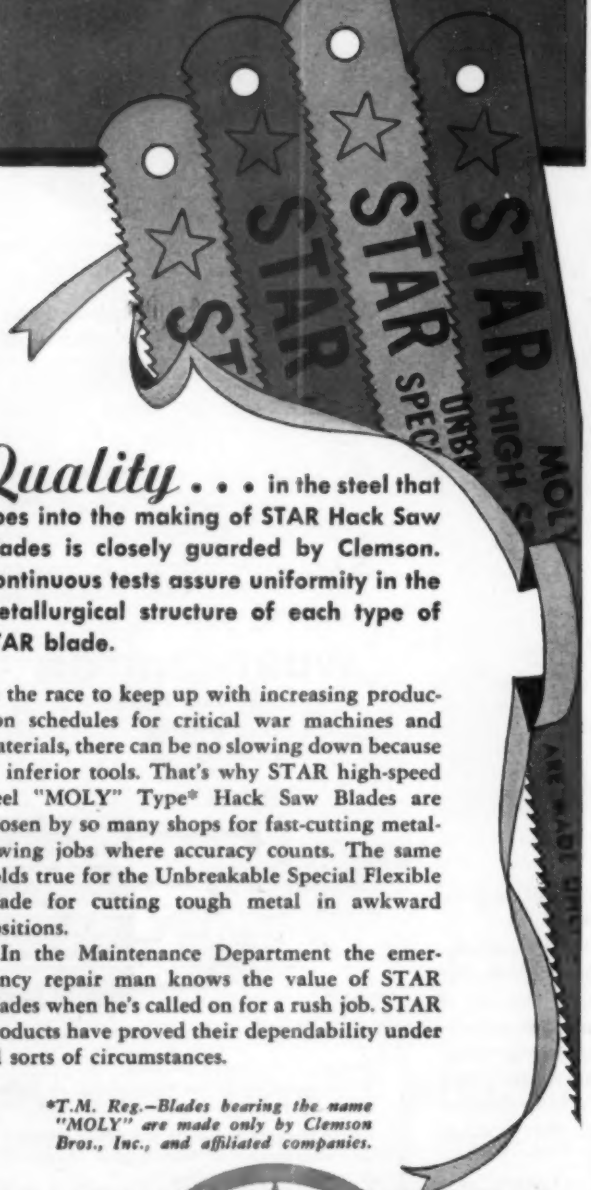

Quality **. . . in the steel that goes into the making of STAR Hack Saw Blades is closely guarded by Clemson. Continuous tests assure uniformity in the metallurgical structure of each type of STAR blade.**

In the race to keep up with increasing production schedules for critical war machines and materials, there can be no slowing down because of inferior tools. That's why STAR high-speed steel "MOLY" Type* Hack Saw Blades are chosen by so many shops for fast-cutting metal-sawing jobs where accuracy counts. The same holds true for the Unbreakable Special Flexible Blade for cutting tough metal in awkward positions.

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**T.M. Reg.—Blades bearing the name "MOLY" are made only by Clemson Bros., Inc., and affiliated companies.*

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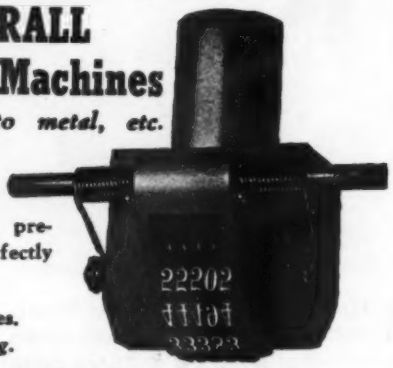
NUMBERALL Numbering Machines

for stamping into metal, etc.

AUTOMATIC
MODEL NO. 50



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Desmond Cutters

Desmond Hex Dresser

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THE NEW AERCO MULTI-GRIP-CHUCK

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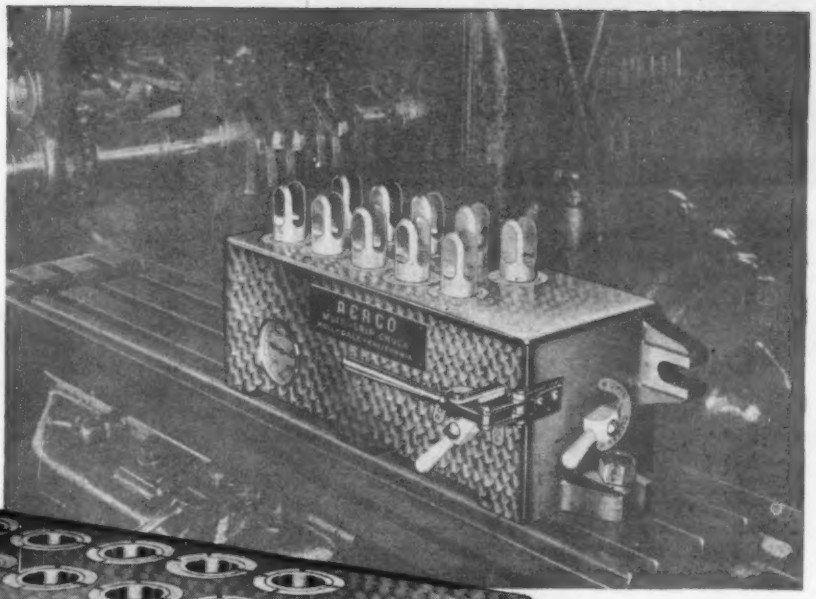
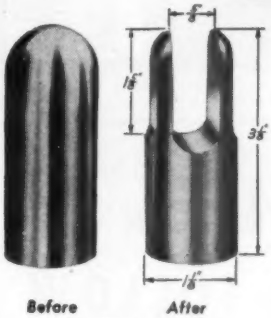


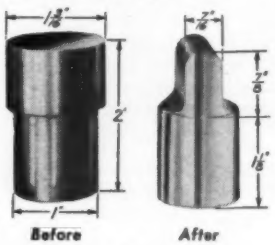
MODEL 10-E



Before After

Aluminum Parts

These aluminum parts were milled upon the Aerco Multi-Grip chuck at the rate of 355 per hour (floor to floor) as compared with single milling operations of only 71 per hour.



Before After

Chrome Steel Parts

These parts, high heat treated of Chrome-moly, were produced at the rate of 62 per hour (floor to floor) on the Aerco Multi-Grip Chuck. Individual milling time was 15 per hour.

MULTIPLIES MILLING OUTPUT

Without Added Men or Machines

Not one, but ten pieces are milled with a single loading—with production increases from 100 to 500%.

Two rows of collets hold ten parts so that both rows are milled simultaneously. Collets range from ½" to 1¼" inclusive.

In spite of any slight variations in shank diameters, parts cannot be milled off-center, because self-centering aligning collets insure exact concentric position. Safety stop prevents damage to collets should all stations not be filled.

A few strokes of the hydraulic hand pump lever builds pressure to 3000 p.s.i. Work is held rigidly in collets and cannot turn or be pulled out during milling operation, however clamping pressure is instantly released when desired. Self-opening collets are quickly re-loaded.

For complete information, write or wire

AERCO CORP.

HOLLYDALE, CALIFORNIA

Manufacturers of precision equipment for Aviation and other industries.

ARMY E NAVY

Tool life greatly increased by reconditioning cutting oil *with*
BARRETT OIL EXTRACTION SYSTEMS

Reports from plants using Barrett Oil Recovery and Reconditioning Systems show surprisingly high percentages in increased tool life. Then, too, users are enthusiastic as to the improved condition of the reclaimed oil as well as the high returns on the investment. Some set-ups in plants engaged on defense production have paid for themselves in a few months.

The Barrett Centrifugal Oil Extractor—which is part of a complete system—recovers 100% of the removable oil or 98½% of the contained oil from chips and turnings in 2 minutes or less. Complete Barrett oil recovery and reconditioning systems include Extraction, Sterilization and Sedimentation, together with filtration. The units involved are available in various sizes, individually or as a group, and are available with full manual control, semi-automatic control or with full automatic control requiring only loading, unloading, starting and stopping of the extractor by the operator. Complete plans including storage tanks for reclaimed oil or for use in conjunction with existing equipment are also available.

With the Barrett system, abrasive-free oil assuring longer tool life can always be depended on. With Barrett Sterilization and Sedimentation equipment, cutting oil is also safe and free from contamination.

Investigate Today by Sending for Descriptive Bulletin of Oil Recovery and Reconditioning Systems

Barrett Centrifugal Oil Extractor—the heart of Barrett Cutting Oil Recovery and Reconditioning Systems.

THE LEON J. BARRETT CO., WORCESTER, MASS.
Designers and Builders of Centrifugal Machinery

SELECT THE RIGHT WHEEL
AND SAVINGS WILL FOLLOW

Vitrified makes it possible to standardize on grinding wheels by offering a wide range of standard types which cover practically all wheels used on standard makes of grinding machines.

Selection of the right wheel for the work to be handled is simplified in the Vitrified catalog—a 65-page booklet which gives specific data, dimensions, etc., covering the entire Vitrified line.

Send for this catalog. Choose a grinding operation in your shop on which you would like to cut costs. Select the Vitrified wheel which meets your specifications, try it out, and compare results with the method formerly used—and you, too, will join the long list of progressive manufacturers who have standardized on Vitrified.

Write for the catalog today

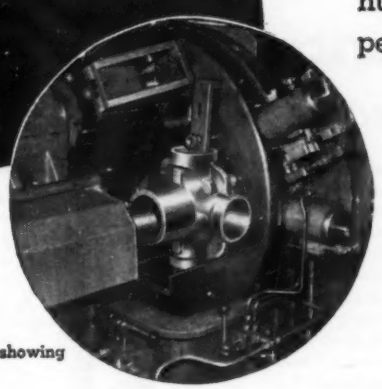
VITRIFIED

VITRIFIED WHEEL COMPANY
WESTFIELD **MASS.**

THE PIECE OF PAPER *that broke a bottleneck*

Close-up of completed propeller hub.

The Lapointe HP-150 which broaches 2 propeller hubs at one time.



Close-up of loading position showing automatic fixture.

"Work plan — 1776-D1" was the appropriate nomenclature for the machine and broaches which today are making production figures unbelieveable a few short months ago. They are the chief bottleneck breakers in putting out spline propeller hubs for a new type aircraft propeller. Made of especially hard steel, these new propellers could be turned out in mass production with the precision tolerances desired only by broaching. Exact production figures are a secret but hub splining is no longer the bottleneck.

ARMY E NAVY

The LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.

BASKETS

MADE TO INDIVIDUAL REQUIREMENTS
for annealing, brazing, carburizing, cyaniding, dipping,
hardening, heat-treating, materials-handling, nitriding,
pickling, plating, quenching, washing.
CLINCHED OR WELDED CONSTRUCTION

TRAYS

All metals — all weaves — all sizes. Send us your sketch or blueprint.

THE LUDLOW-SAYLOR WIRE COMPANY

634 S. NEWSTEAD AVENUE **ST. LOUIS 10, MO.**

CRITERION *Boring Heads*

Original Accuracy *Maintained*

Noted for maintaining original accuracy over a longer period Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

CRITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 15

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

YOUR new product for postwar may be "back of the screen" or out in the open—in blueprints on the board or working models under test. Or, the "new products" may be your former lines brought up-to-date. Whatever your plans, you can be sure of this:

The lower your buying costs, the lower will be your producing costs. And in peacetime just as now you will *keep on* saving money by purchasing from your ✦ Industrial Supply Distributor—using him as your central source for all materials and parts, instead of scattering your orders among the manufacturers.

Today *and* tomorrow—before you order Cle-Forge High Speed Drills, Peerless High Speed Reamers, or other supplies—check with your Industrial Supply Distributor.

He probably can send what you need from stock—or already has it coming in. It saves your time—it helps keep your production rolling at top schedules—to

Telephone your ✦I✦S✦D✦ FIRST!

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ARMY NAVY

ARMY E NAVY

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

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30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6315 SECOND BLVD. DETROIT · LONDON—E. P. BARRUS, LTD.—35-36-37 UPPER THAMES ST., E.C.4

Inside this Cover is a "Can't Be Done"

that *WAS* done!

It is not a claim but a plain, unvarnished truth that Apex heavy-duty aircraft universal joints combine:

Highest strength (axial and torsional) weight ratio obtained to date;
Greatest resistance to fatigue and vibration;
Longest service life;
Permanently sealed-in lubrication;
Fully meet AAF "Winterization" directives.

The cover, an exclusive Apex development, makes the lubricant integral with the joint and lengthens its life by reducing wear and vibration, the two worst enemies of joints in service.

Now used in crucial controls of both Army and Navy combat aircraft, these Apex joints have achieved a highly improved strength-weight ratio over previous types in their field and have widened the usage of universal joint applications. They exceed all requirements of the current AAF Specification for Class 2 Universal Joints, and AAF Standard Sheet No. 271.

Five sizes are available with torque ratings up to 10,000 inch pounds. Your request for any desired data will receive prompt attention.

THE APEX MACHINE & TOOL CO.
DAYTON, OHIO
Exclusive Licensee Under F. & S. Joint Patents

APEX Aircraft Universal Joints

DE-BURR MECHANICALLY!

ROTO
THE STURGIS PRODUCTS CO.
STURGIS • MICHIGAN
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FINISH

Roto-Finish is a startling, versatile new process for the mechanical de-burring, grinding, honing, buffing, and coloring of metal parts. Using a revolutionary adaptation of the tumbling process, Roto-Finish successfully finishes *steel*, *brass*, *aluminum*, *stainless* and *nickel steels*. It can be varied from a rough grinding action to the finest finishing.

Dozens of the large war producers report savings up to 96% over hand finishing methods. Roto-Finish is being used on castings up to 75 pounds down to small, delicate, intricate parts a fraction of an ounce. Hundreds of small parts can now be finished in a fraction of the time required before. Write for complete information, or send samples to be processed, without charge.

THE STURGIS PRODUCTS CO.

203 JACOB STREET, STURGIS, MICHIGAN

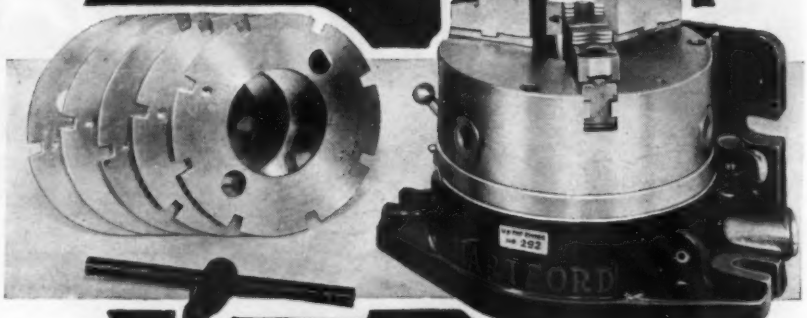
Faster, accurate indexing coupled with great holding power SAVE PRODUCTION TIME

The capacity of this modern, sturdy, indexing device is limited only by its holding power. In many of its applications, both speeds and feeds can be stepped up, without impairing accuracy, thereby assuring better and faster work in less time and at lower cost. Mask plates eliminate all chance of error.

The HARTFORD SUPER-SPACER is applicable to a wide range of operations—on drilling machines, millers, slotters, planers and jig borers. It can be used in either a horizontal or vertical position, an advantage which greatly extends the scope of its utility.

Attachments for facilitating both plain drilling and radial drilling are available, which eliminate the need of costly fixtures for these operations.

The HARTFORD Super-Spacer



Write at once for illustrated booklet showing some of the many uses of the HARTFORD SUPER-SPACER in today's production.

THE HARTFORD SPECIAL MACHINERY CO. HARTFORD, CONN.

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

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THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
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TELEPHONE: JAMAICA 6-4090

NEW NON-DRYING PRUSSIAN BLUE
GRADE NO. 9
Easily removed with alkali or oil solvents. 1 oz. Sample Jar, 6-Jar Carton container — $1.50 Postpaid.

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LEADING THE INDUSTRY IN CARBIDE TOOLS SINCE 1930

Vascoloy RAMET

TANTUNG CUTTING TOOLS — DIES

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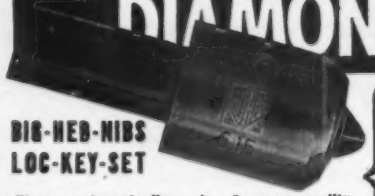
VASCOLOY RAMET CORP. • NORTH CHICAGO, ILLINOIS

DIAMONDS for Victory



BIG-HEB-NIBS LOC-KEY-SET

Three grades of diamonds. Common quality $21 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour templets diamonds supplied only in Medium and Select quality.)

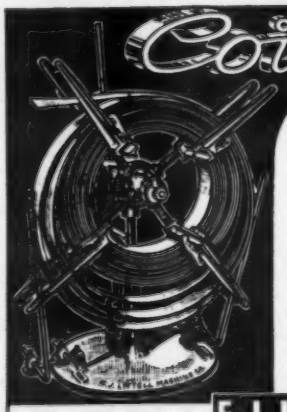
All diamond sizes 1/4 to 10 karat are oil mounted for immediate shipment . . . Bills subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service. $1.00 post paid.) Grinders instruction card free.

RE-SET-ABLE
Cooler dressing
Closer Tolerances
Micrometer Accuracy
Because: Wing key heat dissipation and absolute diamond lock nib.

The Most Complete and Up-to-the-Minute Line of Diamond Tools for War Production. Send for Free Catalog

DIAMOND TOOL COMPANY, Nat Inc.
Sheldon M. Booth, Pres.
931 E. 41st Street CHICAGO, ILL.

Coil Stock
feed it faster with **LITTELL** AUTOMATIC CENTERING **REELS**



WAR production is rolling along faster where roll stock is uncoiled with LITTELL Automatic Centering Reels. They insure a free-flowing loop of material. Coil capacities up to 20,000 lbs.

Littell also makes a complete line of other press-room equipment—Roll, Dial, Magazine and Hopper Feeds—Straightening Machines, Air Blast Valves, Pres-Vac Safety Feeders, etc. What are your requirements?

ASK FOR BULLETINS

Littell No. 3 Reel. Capacity 300 lbs.

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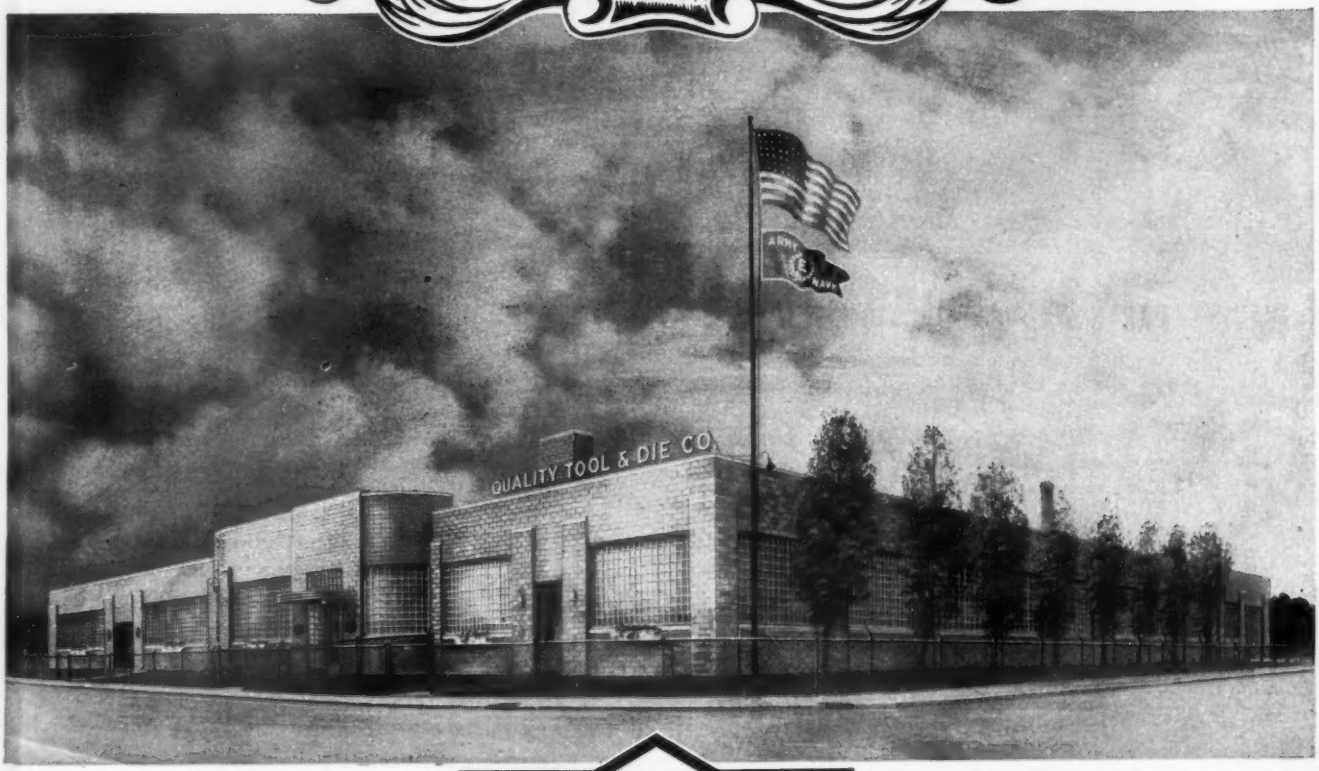
EST. 1929
QUALITY TOOL AND DIE CO.
REG. U. S. PAT. OFF.

EXPANDING

EXPANDING

TO MEET TODAY'S NEEDS AND TOMORROW'S OPPORTUNITIES

This newly enlarged plant provides our skilled executive and production personnel with facilities to fill the flood of war-time orders for "Quality" Precision Gages. These same proven facilities will be at your service in solving Post-War Tooling and Manufacturing problems.



Manufacturers of "QUALITY" Products

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Speed Victory — Buy War Bonds

EST. 1929
QUALITY TOOL AND DIE CO.
REG. U. S. PAT. OFF.

407 N. NOBLE ST.
INDIANAPOLIS 2, INDIANA

Facts you should know

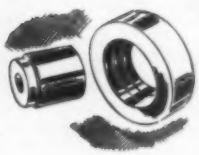
ABOUT TODAY'S CHROMIUM PLATING

THE CHANCES are that you already have an over-all picture of the many virtues of chromium plating . . . its extreme hardness, high resistance to chemical attack, unusual surface properties, etc., etc.

But very possibly you do not know all the ways in which these properties are being utilized in the war effort . . . the countless applications where one, two or several of the advantages of chromium plating have proved invaluable in stepping up production . . . improving performance . . . or saving priceless time and materials.

The facts here, of course, must be extremely brief, but complete information on each specific application is available both to our present licensees and to any interested manufacturer. Having pioneered in the chromium plating field, United Chromium makes available the results of years of research and development work — covering all the ramifications and possible uses for electro-deposited chromium.

INCREASING OUTPUT OF METAL-WORKING TOOLS



Chromium plating not only increases the life of many tools but often reduces stoppages and speeds output, as in the case of drawing and forming dies. Chromium plated drills are cutting more holes between sharpenings. On burnishing bars, chromium steps up production, produces a finer finish. These and many other tools are returned to service by rebuilding worn surfaces with chromium.

REDUCING WEAR ON CYLINDERS AND RINGS

Where equipment parts such as cylinders, piston rings and other parts of internal combustion engines are subjected to wear, and can utilize an oil-retaining type of finish — chromium plating having the proper degree and depth of porosity results in greatly improved performance. Large quantities of such parts are now being processed by our licensees to meet severest operating conditions.

SALVAGING PARTS AND PRODUCTION WORK

By chromium plating parts which have been machined off-size, many plants are reclaiming rejects — saving the metal as well as man-hours of labor represented in each piece. Successful applications of chromium for salvage include: — cylinders, pistons, axles, drive shafts, gears, valves, ball and roller bearing parts, and many types of taps, dies, jigs, fixtures and gauges.

PROTECTING PRECISION OF EQUIPMENT PARTS

Where maintenance of dimensional accuracy is essential to smooth operation and precision work, many manufacturers make it standard practice to apply a deposit of chromium on such parts as: — feed screws, shafts, cylinders, piston rods, pivots, cams, eccentrics, landing gear struts, etc. Chromium combines extreme hardness with a low coefficient of friction which reduces wear and prevents scoring.

UNITED CHROMIUM TECHNICAL ADVICE ASSISTS LICENSEES TO:

1. **Obtain installations properly designed for specific requirements.**
2. **Put installations into prompt production.**
3. **Meet strictest specifications.**
4. **Conserve metals and materials.**
5. **Utilize manpower more efficiently.**
6. **Eliminate possible plating bottlenecks.**
7. **Reduce waste due to rejects.**
8. **Lower over-all plating costs.**

IF YOU have any questions about the applicability of chromium plating in connection with your work, please write United Chromium, outlining your problem. Also send for our helpful booklet "The Last Thousandth of an Inch" containing further suggestions on how Chromium Plating can be used.

UNITED CHROMIUM
INCORPORATED
51 East 42nd Street, New York 17, N. Y.
Waterbury, Conn. ☆ Detroit, Mich.

Built for the word "GO"

"The rocket's red glare—bombs bursting in air"—immortal words from America's past, but words now sung more frequently than at any other time in our history. Today these words are accompanied by deadly weapons of war whose flawless performance assures success to our fighting men. How well these weapons work, however, depends on the degree of accuracy achieved in the manufacture of mating parts. For this give credit to those watchdogs of precision and accuracy—gages which guarantee perfect "GO" performance.

Kobe Master and Reference Gages are built to "go." Every scientific approach to improved manufacturing methods and processes is investigated and checked for practical application to Kobe production principles. Exhaustive laboratory analysis . . . the development of special machines and tools . . . master gaging by special instruments, some of them accurate to ten-millionths of an inch . . . constantly controlled conditions of temperature and humidity, and highly trained technicians are all fundamental to Kobe operations. Experience, perhaps the most important of all in gage manufacturing, rests on Kobe's record in the industry over past years.

Wartime and its urgent demands takes the greatest part of current production. Kobe, however, for sometime has been planning for industry's needs when peace arrives. Matchless production facilities, the result of accelerated and war-stimulated requirements, will be the basis of Kobe post-war operations. The modern plant and expanded facilities, developed to the fullest during wartime, will be devoted to the manufacture of high-accuracy master and reference gages to check accuracy and precision in every peace-time industry. Kobe gage developments of today will be industry's peace-time assets of tomorrow.

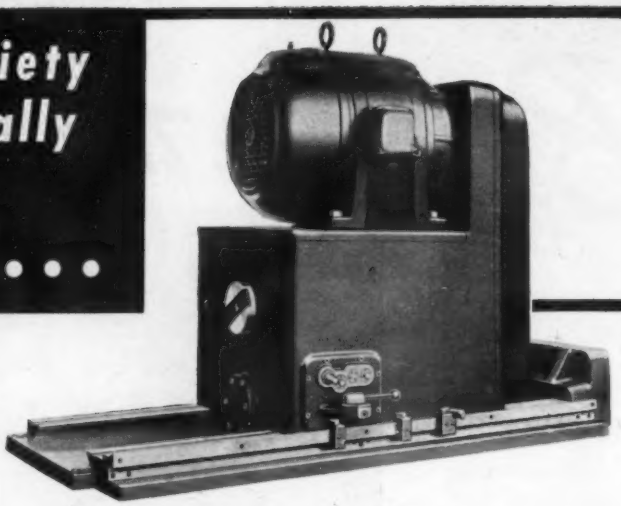
KOBE

Master and Reference GAGES

KOBE, INCORPORATED

3040 East Slauson Avenue • Huntington Park, California

You can produce a variety of parts more economically with a HOEFER UNIT...



★ These units can be used either as individual units, in groups, or in combination with other machines doing boring or allied operations while the machine performs its functions. These units can also be made into way machines for the most economical production of a variety of parts. They can also be equipped with HOEFER Multiple Spindle Heads with spindles for various operations in multiple.

These units may be operated in any position to suit the requirements of the work, horizontally, vertically, or at an angle — meeting every production drilling need at a fraction of the cost of special drilling equipment. When several of these units are operated in conjunction with one another they may be individually controlled or operated with remote group control as desired.

HOEFER Self-Contained Hydraulic Feed Units give you production flexibility. They are never obsolete and can be used with perhaps a new base in the construction of a new drilling set-up for the new part. These units therefore are ideal equipment to have for those now producing war and other vital equipment and who will change over to peace time products with war's end.

Consult with us now — let us show you exactly what a HOEFER Unit will do for you in terms of equipment and production savings.

Hoefer's Whole Business is Holes . . . .

HOEFER MFG. CO. *Freeport, Ill.*

Almond Drill Chuck

Write for further information.

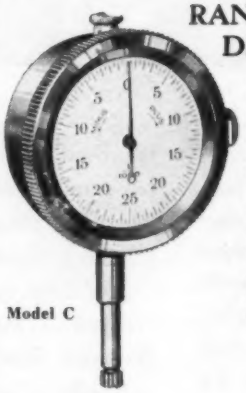
. . for over 70 years

ALMOND THREE-JAW DRILL CHUCKS—the first to be placed on the market more than seventy years ago—pioneered the field of drill chucks. During all these many years, ALMOND CHUCKS have continued to be a necessary part in the logical procedure of machine developments.

Made in types and sizes to fit all machine tools and portable drills.

The Original Manufacturers of Drill Chucks

T. R. ALMOND MFG. CO.
Ashburnham, Mass., U.S.A.



Model C

RANDALL and STICKNEY Dial Gauges and Indicators

are accurate, reliable and built to stand the gaff of hard usage.

This Model C Dial Indicator has a 2½ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .005 in. or .01 mm. Has a ½-in. range, movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units, so that repairs can be made easily. There is a R. & S. Gauge for practically every purpose. Write for catalog describing our complete line.

RANDALL & STICKNEY
Waltham, Mass., U. S. A.
Makers of Dial Gauges Since 1885

DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates

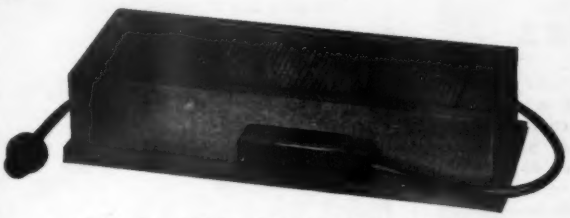
simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301 B N 11th St., St. Louis, Mo.
In Canada: 444 Pacific Ave., Toronto, Ont.

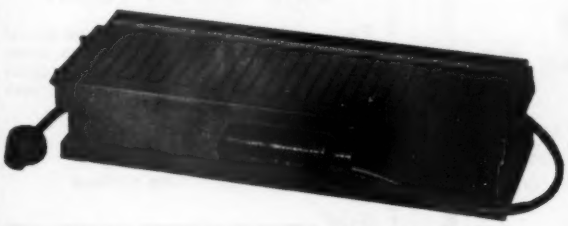
Walker Rotary Magnetic chuck with Concentric Gap—Style D—Face Plate—Walker Rotary Chucks are made in sizes from 4" to 72" diameter with Face Plate construction adapted to the work to be held.

STEP UP WAR PRODUCTION by saving set-up time with WALKER MAGNETIC CHUCKS *



Walker No. 617 Bar Pole Face Rectangular Magnetic Chuck, for holding small thin work. Sizes range from 6" x 10" to 12" x 60".

Walker Universal Swivelling Magnetic Chuck sizes 5" x 10", 4" x 20" and 4" x 30"—can be arranged with Vernier Reading.



Walker No. 618 Rectangular Magnetic Chuck—available in sizes from 4" x 8" to 30" x 96".

WALKER DEMAGNETIZERS

These units are available from Walker in standard D.C. and A.C. types for 110 or 220 V service. They provide a fast and convenient means of removing residual magnetism from a wide variety of parts. Send for Circular K7 giving detailed information.

•

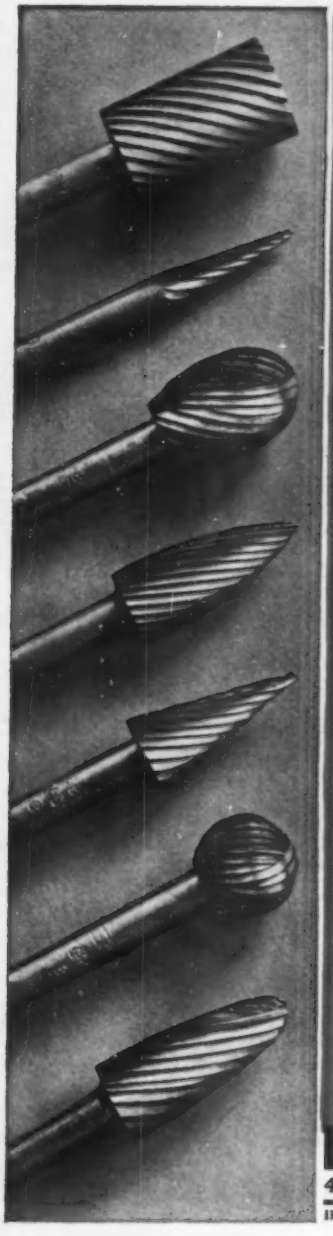
Because of their ability to hold work securely under heavy cuts, Walker Magnetic Chucks fit into the demand for high production of war materials. Then, too, these dependable units contribute to more and better work in less time.

Of proved design and utmost dependability, Walker Magnetic Chucks in Rectangular and Rotary Types help speed up grinding, milling, planing and turning operations. Standard units are available for practically any chucking need. A complete range of sizes makes it possible to select exactly the right Walker for your problem. Magnetic chucks for special requirements can be furnished in reasonably short time.

Come to Walker for magnetic chucks and you'll save time and speed up war production.

Write for catalog No. W4
giving complete information

O. S. WALKER CO., Inc.
Worcester, Mass., U.S.A.



Grobet
ROTARY FILES

Grobet Hand Cut, Milled Cut and Ground Cut ROTARY FILES can now be purchased in units of 50 to 100 in a special shipping container, without extra cost. This strongly made box is ideal for use in place of a rack. Files do not touch and are kept clean and in perfect condition. Also used to return files for resharpening.

Send for Catalog MR, most complete, illustrating and describing GROBET ROTARY FILES, DIESINKER'S BURS, TUBE BURRING CUTTERS, CHATTERLESS COUNTERSINKS, etc.

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421 Canal Street — **New York, 13 N. Y.**

IMPORTERS OF GROBET SWISS FILES — MFRS. OF GROBET ROTARY FILES

5000 Shapes and Sizes Grobet Swiss Files

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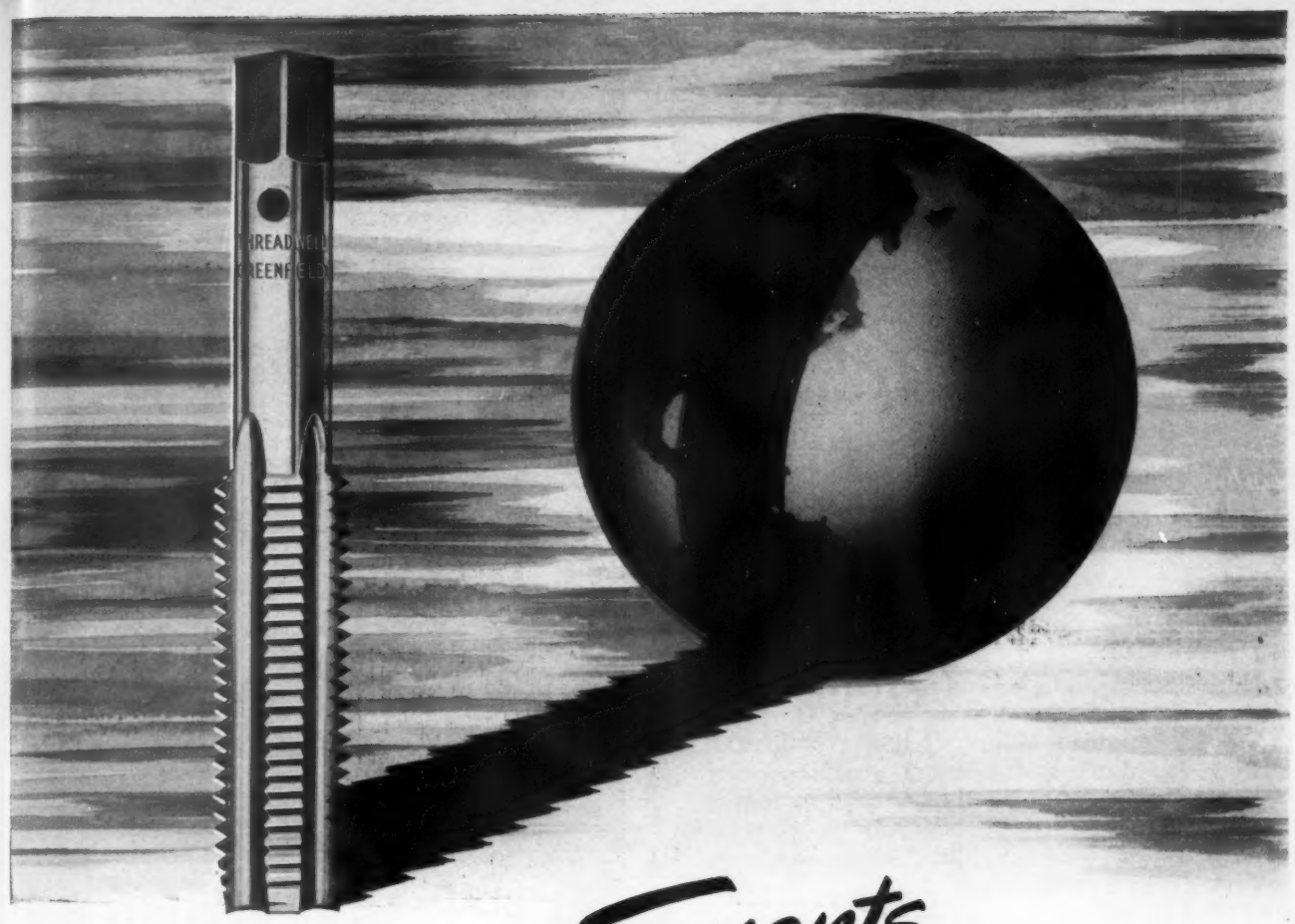

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CAST THEIR SHADOWS BEFORE!

ALREADY the outlines of a great and prosperous future are taking form in the minds and plans of American industry. At hand are new and better tools, created to meet the exacting demands of war production, ready to be converted to peace. A bright star has risen on the small tool horizon during the war . . . a better, more accurate, longer lived threading tool . . . the *Threadwell Tap.* In months to come it will help many of America's leading industries make a better product at less cost.

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If you haven't yet tried Super Carboloy Tipped Milling Cutters, now is the time to do it! You'll learn first-hand why production men the country over who are interested in stepping up production and stepping down costs, specify SUPER. Write TODAY for complete details as to descriptions, sizes and new low prices.

All sizes available from stock for immediate shipment.

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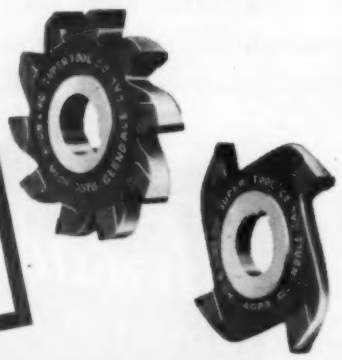

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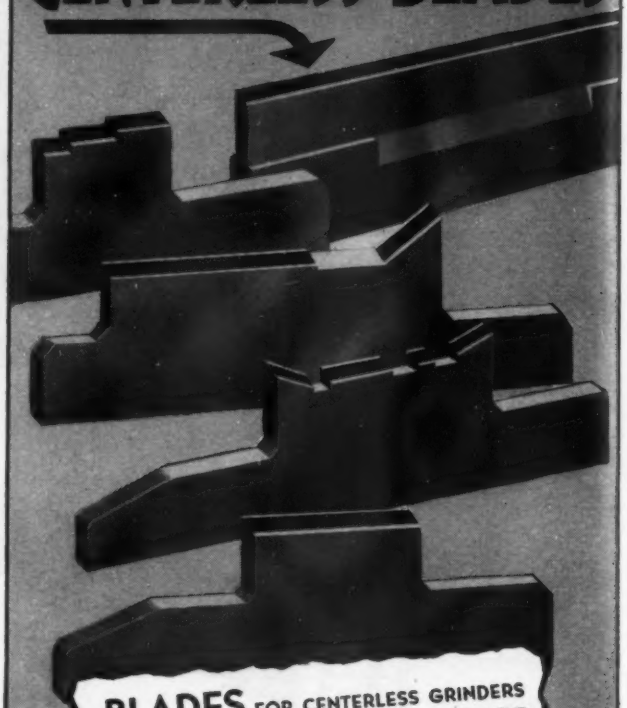

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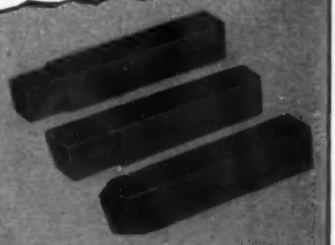
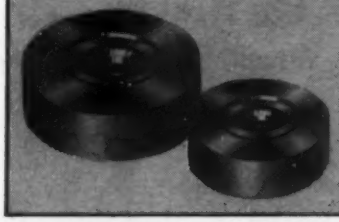
Talide-Tipped Tools for all types of turning, boring and facing operations on steels, cast iron and non-ferrous metals and non-metallic materials. Send for catalog No. 43-T.





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Here is another of many ways in which Lepel Induction Heating is helping to step-up wartime production.

The cans are prepared for soldering in the usual manner. The assembled cans — two at a time — are placed within the specially designed high frequency load coils and heated to soldering temperature in ten seconds.

As the heat is generated within the metal itself, the solder penetrates throughout the seam. Since heat is concentrated in the seam and excessive temperature is impossible, there is practically no discoloration.

Lepel Induction Heating quickly and neatly solders and brazes all ferrous and non-ferrous metals, using soldering and brazing alloys from lowest to highest melting points. By pre-fluxing and preplacing of the alloy in the form of rings, strips or irregular shapes, the most intricate work is so simplified that it can be performed by any unskilled worker with minimum use of the alloy.

By the use of load coils designed for the work, the same compact, portable unit, manually or automatically operated, can be used for any type of soldering or brazing operation or for hardening, annealing, stress relieving or melting.

A Lepel field engineer will be glad to discuss your soldering, brazing or heat treating operations and offer suggestions for doing them faster, better and more economically by the Lepel method.

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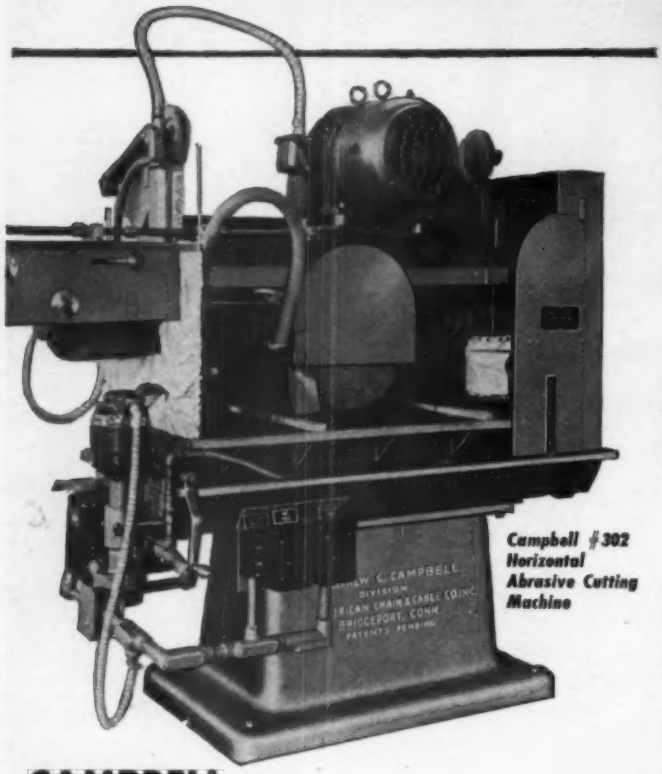
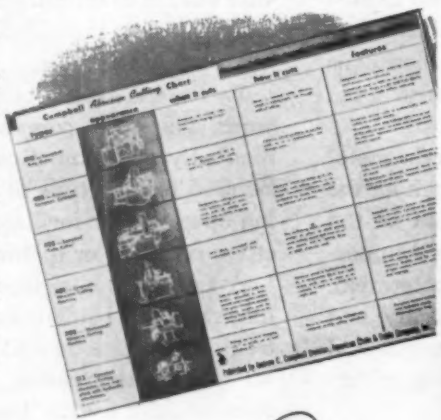


Campbell #302 Horizontal Abrasive Cutting Machine

CAMPBELL ABRASIVE CUTTING MACHINES HELP MEET LABOR SHORTAGE

According to WPB, the peak of the skilled labor problem has yet to come. • If you cut any of the annealed or unannealed steels, non-ferrous alloys, plastics, glass or ceramics—solid bar, tubular or flat stock—a CAMPBELL ABRASIVE CUTTING MACHINE will help you. • Tell the CAMPBELL Engineering Department materials, shapes, sizes, lengths before cutting, lengths of cut off pieces and hourly production required. They'll give you cost data and production procedure without obligation. *ASK* for a copy of the CAMPBELL ABRASIVE CUTTING CHART. It shows how the CAMPBELL complete line of Abrasive Cutting Machines can be used to open the way to new highs of production and new lows of cutting costs.



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WAR DEPARTMENT
OFFICE OF THE UNDER SECRETARY
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27 November 1943

To the Men and Women
of Plant Number 2
American Laundry Machinery Company
2050 Section Avenue
Cincinnati, Ohio

I am pleased to inform you that you have won for the second time the Army-Navy Production Award for meritorious services on the production front.

You have continued to maintain the high standard that you set for yourselves and which won you distinction more than six months ago. You may well be proud of your achievement.

The White Star, which the renewal adds to your Army-Navy Production Award flag, is the symbol of appreciation from our Armed Forces for your continued and determined effort and patriotism.

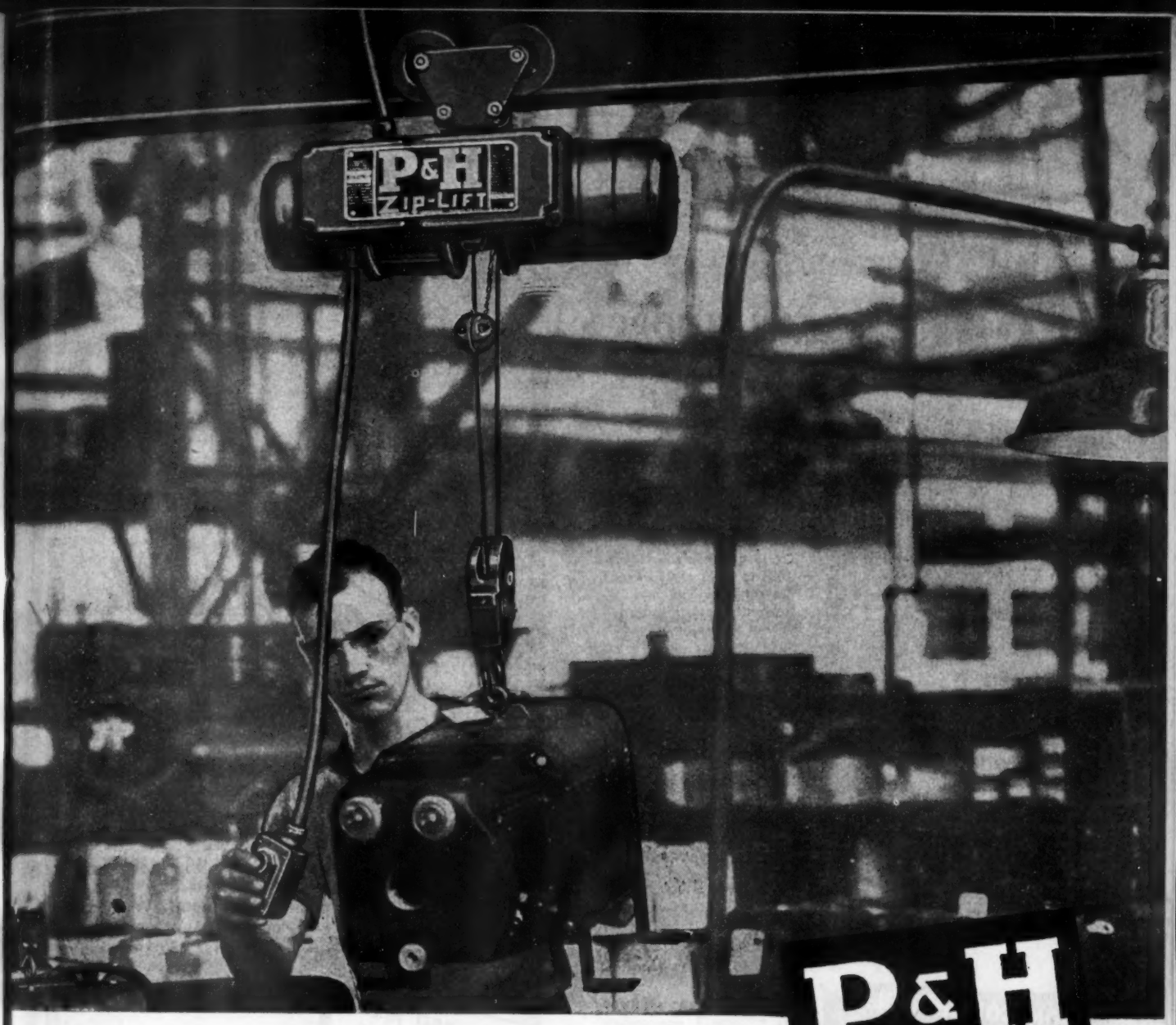
Sincerely yours,

Robert P. Patterson
Under Secretary of War

When the workers of our Cincinnati Plant won the coveted Army-Navy "E" Award, they pledged to *continue* the same high standard and fine record in the production of war materials.

Now, on being honored with the White Star, symbolizing their second Army-Navy Production Award, these workers renew their pledge with added determination and an even stronger will to produce *more* and *more* UNTIL VICTORY IS WON.

The AMERICAN LAUNDRY MACHINERY COMPANY
CINCINNATI 12, OHIO



WORK *FASTER* WITH P&H ZIP-LIFT HOISTS

That's important—when war production asks more of every worker. Zip-Lifts save time for skilled hands—keep them busy on productive effort.

Zip-Lifts save effort, too—let workers be *good* workmen all day by reducing fatigue to a minimum.

But Zip-Lifts do more than that! By keeping materials moving faster—putting loads exactly where they're needed—Zip-Lifts cut costs. That's important today, and will be even more important tomorrow. These small electric hoists pay for themselves twice a year on the average.

Write for new Zip-Lift bulletin which shows dozens of ideas that save time and money with "thru-the-air" handling.

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OIL AND GREASE ABSORBENT AND FLOOR CLEANER

SAFE CLEAN FLOORS with this New Dry Compound!

Absorbo, when scattered over oily or greasy floors provides safe, sure footing. It's not necessary to sweep up re-occurring oil spills repeatedly, as Absorbo will retain oil or grease up to 45% to 50% of its weight. Prevent accidents and attendant work stoppages caused by slippery underfooting, by applying Absorbo to *your* floors.

Because of the sponge-like nature of its granules, and the absence of any gritty substance, Absorbo will not mar machine parts or surfaces. It may be used freely without abrasive action on all types of floors—wood, metal, concrete or linoleum.

Absorbo has been approved as a Class 1 non-combustible by Underwriters' Laboratories. Even when thoroughly oil-soaked it will resist burning and retard the spreading of fire. It eliminates the hazards of the highly flammable sawdust ordinarily used for oil-soaked floors.

Send coupon for 50 lb. bag with unconditional money-back guarantee.

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Dept. D5, 430 Riverside Avenue, Newark 4, New Jersey

Gentlemen: Send ..... 50 lb. bags of:
Absorbo Oil & Grease Absorbent and Floor Cleaner at $2.75 per bag, F. O. B. Newark 4, New Jersey.
Substantially reduced prices for quantities.

Name.....

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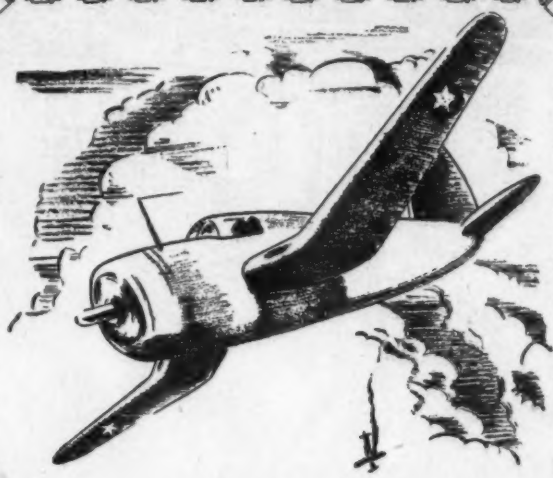
Attention of:.....

Signed:..... Title.....



WHEN *Precision* COUNTS

It takes precision flying and precision firing for a pilot to down an enemy plane. Today's demands on marking equipment, likewise, are for speed, accuracy and winning performance. Countless thousands of vital parts for victory are being marked every day faster, better and at lower cost on precision built Noblewest marking machines. Why not let us solve your marking problems. Write today for our new catalog supplement No. 43—"Your Guide To Better Marking."

MODEL 163
Does marking that formerly required six men—and does it far better. "One of the best machines that has come into our plant!" exclaimed an aircraft official.

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YOU'LL GET IMPROVED RESULTS—LONGER TOOL LIFE —FASTER PRODUCTION—OR YOUR MONEY BACK!

*RECENT REPORTS ON ACTUAL PLANT TESTS OF SAFCO CUTTING OILS

*

Lengthens Tool Life —Improves Finish

Product: Studs

Metal Stock: 17/32" round—SAE 3140 steel

Machine: Single spindle screw machine

Operations: Forming, threading and cut-off

Comments: Upon recommendation by a Swan-Finch Service Engineer, SAFCO No. 521 Cutting Oil replaced another well-known oil on this job. SAFCO No. 521 increased tool life 100% (from four to eight hours), permitted an increase in spindle speed and made a definite improvement in the finish.

*

Increases Tool Life by 25% and Eliminates Rust

Product: Valves and forged steel pipe fittings

Machines: Turret lathes, threading machines and drill presses

Tools: High speed steel

Operations: Turning, forming, drilling and threading

Comments: SAFCO Service Engineers recommend TRANSREX No. 1 for all operations in this plant. Upon adoption of TRANSREX, tool life was increased by 25% and rusting of parts between operations completely eliminated. TRANSREX also proved more economical to use because of greater dilution.

The test cases outlined above are representative of hundreds which fill our files. SAFCO's superiority can be readily established and is convincingly *demonstrated* in *your* plant with *your* foreman the test supervisor.

SAFCO Cutting Oils and Compounds have proved their fitness under all kinds of conditions. They can step up production and reduce tool replacement cost for you, too.

All we ask is your cooperation in letting a Swan-Finch Service Engineer analyze your condition and recommend the SAFCO Cutting Oil or Compound best suited to *your* needs. If you're not satisfied that it gives you better performance, we'll cancel your invoice. Why not write or phone our nearest office and ask to have the Swan-Finch man in your locality call—and arrange the details for you?

Swan-Finch Oil Corporation

R. C. A. BUILDING (WEST), NEW YORK 20, N. Y. • 2596 Hart Avenue, Detroit 14, Mich. • 201 North Wells Street, Chicago 6, Ill.

SCIENTIFIC LUBRICATION—MAKERS AND MARKETERS OF SAFCO CUTTING OILS AND COMPOUNDS
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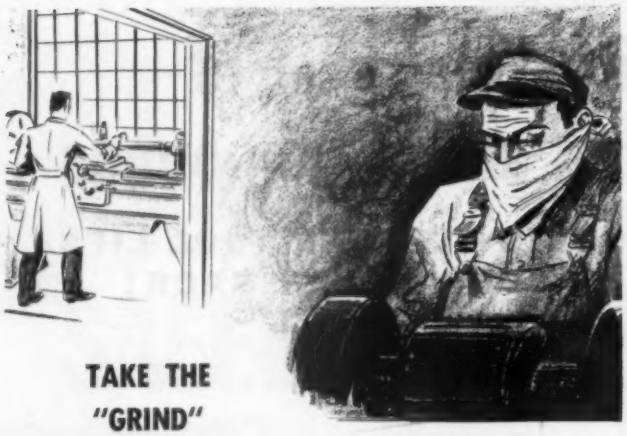

TAKE THE "GRIND" OUT OF GRINDING

A man can't do good work and breathe bad air. Too much dust and grit in the air makes it hard to breathe . . . and handicaps production. There's no reason why the fellow who works on a grinder or buffer can't be as happy at his work as the guy in the next department. The "grind" of grinding is caused by loose dust and grit.

A Cincinnati Air Master on the job traps dust and grit . . . the very second it flies from the wheel. It protects worker, work and machinery. It helps "up" production. It's easy to install . . . easy to clean. Three sizes—to fit all grinders and buffers. Write today—now—for descriptive literature.

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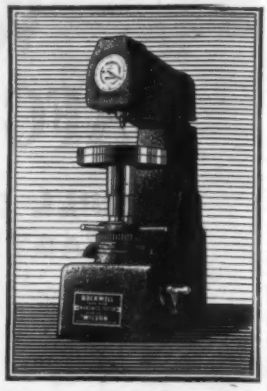

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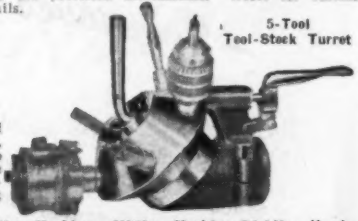
Pat. Pending

Convert your engine lathe into a turret lathe in 15 seconds. To fit Bench lathes and lathes up to 24" swing. Designed to increase production. 6 DAYS DELIVERY.

The 4-Tool Tool-Post Turret is made in 2 sizes. The 5-Tool Tail-Stock Turret is made in 4 sizes. Also Adjustable Pull Feed—easily attached. All tools are precision attachments. Write for further details.

5-Tool Tool-Stock Turret



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"Jefferson Turrets are real production tools — substantial, rigid, accurate and adaptable to any size or make of engine lathes. They must not be confused with the small makeshift gadgets now on the market."

Also — Jefferson Precision Milling Machines, Milling Machine Dividing Heads, Vises, Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles

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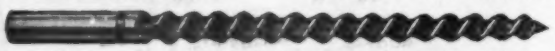

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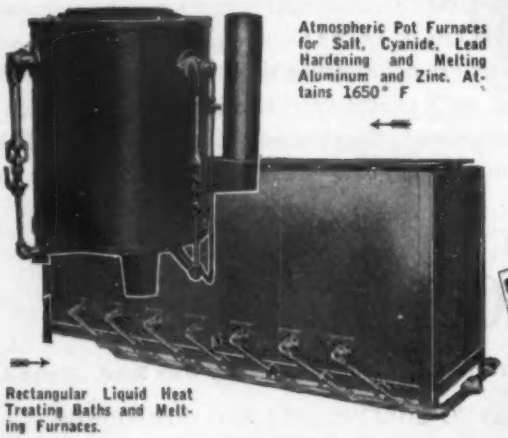

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Rectangular Liquid Heat Treating Baths and Melting Furnaces.

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Automatic TRANSPORTER

NO STRAINING--TUGGING--PULLING NOR PUSHING

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POSITIVE MECHANICAL BRAKE--CONTROLS IN STEERING HANDLE--FORWARD AND REVERSE SPEEDS--FRONT WHEEL POWER DRIVE--SHOCKLESS HYDRAULIC PLATFORM LIFT WITH EASY FOOT CONTROL

• *Miss War Worker and a* TRANSPORTER *can transport the same tonnage of material a given distance that would require the physical effort of three men handling in the conventional way.*

• *The* TRANSPORTER *is built in 4000- and 6000-pound capacity platform type lift trucks for skid transportation and in a pallet type fork lift truck for unit loads up to 4000 pounds on open- or double-faced pallets.*

★ Miss War Worker, whose job it is to transport materials, becomes a high efficiency employee with a TRANSPORTER. Her work consists only of guiding the TRANSPORTER and walking along with the load. This mechanized material-handling truck transports tons of bulk material of various sizes and shapes, or packaged products, doing all the heavy work and accomplishing it quickly and at low cost.

The TRANSPORTER is designed for short hauls within the plant — it handles loads in elevators, along narrow aisles, and is valuable for use in areas where floor loads are restricted. Get details on this modern material-handling truck that has the forward and reverse control buttons in the handle for easy guiding of loads.

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If it's *high efficiency* . . . choose Tannate. Tannate's exceptional strength and firm pulley grip keeps machines running at top speeds, even under severe load conditions. If it's *long life* . . . choose Tannate. It is more resistant to machine oils, moisture and many weak chemicals than oak tanned leather. Furthermore it has the stamina to stand up exceedingly well under today's long work weeks.

If it's *low maintenance costs* . . . choose Tannate. It gives long years of hard service with little if any upkeep except for an occasional treatment with Rhoads Belt Preserver.

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YOU DON'T NEED skilled operators to do fast, accurate TAPPING *with*

Ettco-Emrick TAPPING ATTACHMENTS

With only brief instruction, inexperienced men or women can turn out accurately tapped holes at a fast rate with these Attachments, right on your drill presses. Here are the features that make this possible.

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4. All parts are designed and built for high-speed operation.
5. QUILL CLAMPS are available for mounting on any drill press with absolute rigidity, assuring accuracy.

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Grip is visible, assuring proper insertion of taps every time. 5 sizes, for No. 0 to 1" taps. Details in Bulletin No. 6. Collet type chucks available for No. 6 to ⅜" taps.

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IT GIVES FULL DETAILS

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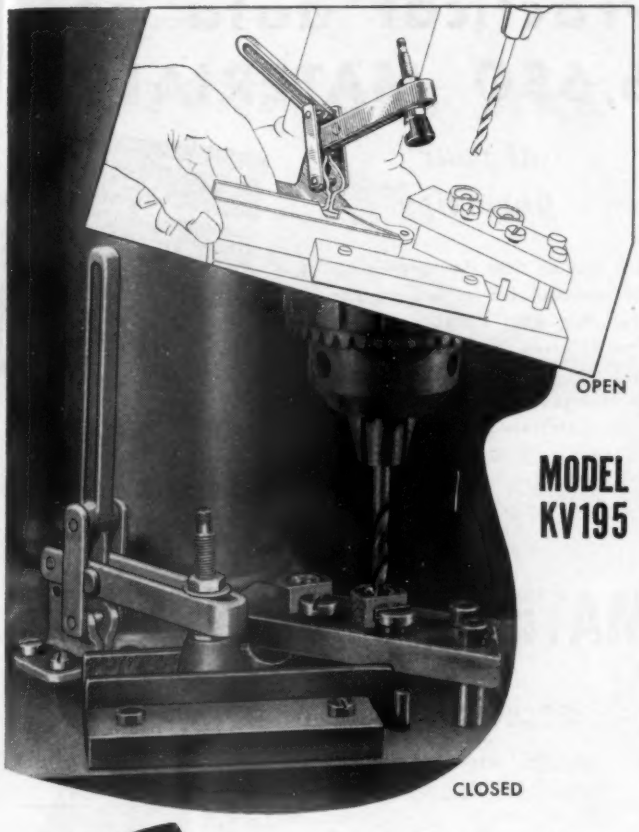
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship



MODEL KV195

ZIP WORK GRIPPED

ZIP WORK RELEASED

That's how fast Knu-Vise clamps operate.

Clamp is adjusted for required pressure when job is begun—never changes until job is finished. Operator simply flips lever to clamp work in position and flips lever back to release it.

Clamp shown above is of double action type. Movement of clamping bar is slower than that of handle, thereby developing a high ratio of pressure applied to work being held in position.

2217 Eighth St., Detroit 16, Mich.

4328 San Fernando Rd., Glendale, Cal.

KNU-VISE
INCORPORATED

CUTTING FLUIDS DESERVE YOUR SERIOUS ATTENTION

Well informed authorities have made the statement that more intelligent application of cutting fluids and better tool grinding would make possible a 30% increase in metal-working production. In these days of man-power shortage, what a challenge that statement presents!

Be honest . . . in your plant are cutting fluid problems given the attention they deserve? Are your performance records accurate? Are you aware of what better cutting fluids can do for the job? Or is your attention centered on other fields until real trouble developes which might be traceable to improper use of cutting fluids? Hundreds of metal-workings plants are getting the most out of their cutting fluids by working closely with the Stuart service engineer. They know that there is no universal cutting fluid, no magic compound—but when a Stuart product is put on the job they are sure they have every cutting fluid advantage that broad engineering experience and "know how" can give them.

To be sure you have all the advantages, work with the Stuart service engineer, representing a company which has specialized in metal-working lubrication since 1865.

A REQUEST OF STUART CUSTOMERS
Containers of all types are critically scarce. We urge you to cooperate with the W.P.B. program to conserve containers by observing these four rules for handling drums.
1. Do not drop.
2. Use a little oil to avoid stripping threads in removing plugs.
3. Replace plugs carefully when drum is empty.
4. Keep drums under cover when emptied.

We invite you to write for our new free booklet, "The 577th Oil," which contains twenty-two case histories, typical examples of how Stuart engineering is solving production problems, (like your own), as well as other valuable metal-working data. State your name, company and title.

ThredKut · CODOL · SUPER KOOL · DA
EXCELENE · ASCC

D. A. STUART OIL CO.
LIMITED
2727 SOUTH TROY STREET
CHICAGO 23, ILLINOIS
ESTABLISHED 1865
Warehouses in Principal Metal-Working Centers

STURACO · SOLVOL · KLEEN KU

TOOL IMPROVEMENTS CO.

TICO

MANUFACTURERS OF
SPECIAL TOOLS AND EQUIPMENT

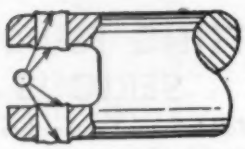
ANNOUNCING

A NEW TOOL

called the

"BURROFF"

FOR BURRING
AND CHAMFERING
THE SHARP CORNERS
ON PARTS LIKE THESE →



Sales Agents: JOHN H. GRAHAM & CO., INC.,
105 Duane Street New York, N. Y.

Write for Descriptive Folder and Prices.

Save TIME...Cut COSTS
in BUSY TOOLROOMS

The valuable time of toolmakers used in setting up larger-than-needed machines can be saved. Here's the compact, precision machine that makes real money for busy toolrooms . . . with fast set-ups, quick changeovers.

LINLEY

HIGH SPEED VERTICAL

MILLING and JIG BORING MACHINE

gives you a choice of 8 spindle speeds . . . one for every need. Direct micrometer setting eliminates pencil figuring errors. Counterbalanced quill removes backlash. Large capacity for small machine. For small important jobs . . . dies, jigs, metal patterns, model making, reaming, milling, etc., investigate the LINLEY.

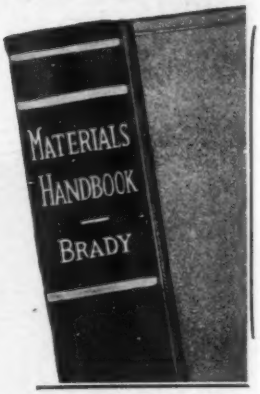
Table size 7" x 17½"
Floor Space 18½" x 20"

Bulletin on request.

LINLEY BROTHERS COMPANY
664 STATE ST., EXTENSION
BRIDGEPORT 1, CONN.

Practical data on
6,650 MATERIALS

at your
fingertips



Save endless time through the use of this handbook for preliminary survey when you need materials. Easy to consult; gives the most helpful facts on kinds, properties, uses, sources, for thousands of natural and synthetic materials needed by purchasing agents, product engineers, factory executives, etc.

Just Published

MATERIALS HANDBOOK

BY
GEORGE S. BRADY

765 pages, 5⅝ x 8¾
$5.00

Enlarged
Up-to-date
5th Edition

An encyclopedia for purchasing agents, engineers, executives, and foremen

Now over 6000 material items are available to you, arranged and indexed for instant reference, and covered with regard to chief characteristics, comparative data, sources, substitutes, adulterants, and uses. Here's a short cut to accurate, essential facts needed in the selection and specification of materials. It points a clear way among new alloys, synthetic resins, industrial chemicals, many materials both new and old. It assembles the most pertinent and important facts to enable you to make quick comparisons, avoid checking many sources and remote possibilities, get quickly to the few materials best suited to a specific purpose.

Find the material you need—*WHEN you need it—in such groups as*

Abrasives
Aircraft Metals
Bearing Metals
Brasses and Bronzes
Building Materials
Corrosion-resistant Alloys
Cupro-nickel Alloys
Fabrics, Leathers, Organic Materials
Fibers
Finishing Materials, Pigments, Solvents
Foundry Alloys and Materials
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Heat-treating Materials
Industrial and Plating Chemicals
Iron and Iron Alloys
Light Metals and Alloys
Lubricants, Oils, and Greases
Metal Groups, Elements
Minerals
Military Chemicals and Commercial Explosives
Molding Materials, Resins, Gums, Waxes
Ores of the Metals
Refractories and Heat Insulators
Steels and Tool Materials
Woods
White Metals and others

10 DAYS' TRIAL—SEND THIS COUPON

McGRAW-HILL
ON-APPROVAL COUPON

McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y.

Send me Brady's Materials Handbook for 10 days' examination on approval. In 10 days I will send $5.00, plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

Name .....

Address .....

City and State .....

Position .....

Company ..... A. 2-3-44

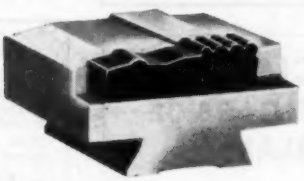
(Books sent on approval in U. S. and Canada only.)

OPERATORS ARE TRAINED *Quickly*

TO SECURE ±.0005" ACCURACY *with the*

Wickman PROFILE GRINDER

TYPICAL EXAMPLES OF WORK GROUND AND INSPECTED ON THIS MACHINE WITHOUT USE OF RADIUS DRESSER OR FORMED WHEEL



Cemented-Carbide Tipped Form Tool
Width of Carbide Tip.....1¾"
Stock Removed .....approx. .040"
Grinding time including set-up and complete inspection of contour before removal from machine ..... 3½ hrs.

The Wickman Profile Grinder is a machine which makes possible substantial savings in machining time. It produces extremely accurate work, tolerances even closer than ± .0005" being secured with reasonable care in operation.

Of most importance, these production advantages can be effected in your plant with relatively unskilled operators assigned to the machines. Any person of average intelligence can be trained in a very short time to become thoroughly efficient in the Wickman method of profile grinding.

The layout and brain-work are done in the drafting room. The operator has nothing to measure. She sees it done. She knows at all times where every point on the contour is, during its development, in relation to every other point on the tool without removing it from the machine for partial inspection. Write for completely descriptive literature.

Circular Form Tool with Preformed Cemented-Carbide Tips
Stock Removed .....015"
Grinding time including set-up and complete inspection before removal from machine
approx. 2 hrs.

BUY MORE—*AND MORE*—WAR BONDS

THE Wickman CORPORATION
15539 WOODROW WILSON AVE.
DETROIT, MICHIGAN

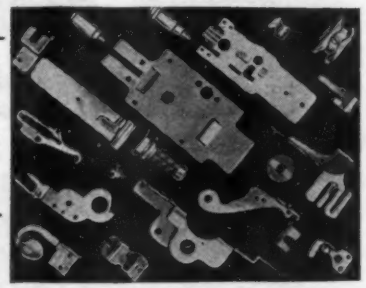
CONTRACT WORK

ADDITIONAL FACILITIES FOR CONTRACT MANUFACTURING

Hand screw machines up to 1½ dia.
Turret lathes up to 15" dia.
Milling machines
Engine lathes
Bench lathes
Drill presses
DoAll contour cutting machine

RELIANCE MACHINE & MFG. CO.
30 Irving Place, New York, N. Y.
established 1922

STAMPINGS AND ASSEMBLIES
IN ALL KINDS OF METALS



Fast and efficient service on long or short runs is guaranteed by our modern equipment and methods, backed by 50 years of experience.
We also offer facilities for the manufacture of screw machine products, tools, dies, jigs and fixtures.
Quality work by skilled mechanics is assured. Send your blueprints or samples today.

"GREATER SAVINGS WITH GREIST"

THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

METAL STAMPINGS
• TOOLS • DIES •
PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E. 23rd St. INDIANAPOLIS, IND.

• Machines and Parts,
• Special Tools and Fixtures,
• Cam Milling, on Contract

Your engineering problems will receive efficient and economical service in our modern plant manned with skilled workers. Contact us today for prompt quotations on your blueprints or samples.

Designers and builders of wire and ribbon stock forming machines.

THE A. H. NILSON MACHINE COMPANY, BRIDGEPORT, CONN.

SPECIAL TUNGSTEN CARBIDE TOOL BLANKS

Any Shape, Size or Grade made to order.
· 10 day Service.

Adamas Carbide Corporation
40-30 23rd Street
Long Island City 1, New York

MACHINE SHOP

Facilities include 9" South Bend Bench Lathe, #2 Brown & Sharpe Milling Machine, Drill Press and 8" x 8" Shaper. The usual line of hand tools and equipment plus experienced workmanship assure your satisfaction. Your inquiries invited.
C. VANDEGRIFT CO., HOCKESSIN, DELA.

PRECISION FORM GRINDING

Specialists in grinding Circular and Flat FORM-TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also step-grinding of Tungsten and Molybdenum Rods.

Send Prints for Quotation and Delivery

J. & S. TOOL CO.—477 Main St.—E. Orange, N.J.
(Makers of J.&S. Radii & Angle Dressing Tools

Our New Enlarged Plant Has Open Time for your Grinding Needs
CYLINDRICAL AND SURFACE GRINDING
Immediate Delivery
We Will Quote You Upon Request
ACME EQUIPMENT CO.
126-8 S. CLINTON ST., CHICAGO, ILLINOIS

PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

WIRE AND METAL SPECIALISTS
in round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
Plating and finishing.
EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

Gray Iron and Semi Steel Castings, also alloyed with nickel, chrome, and molybdenum. Wood, Iron, Brass and Aluminum pattern work.
KING FOUNDRIES, INC.
Phone 823 North Wales, Montg. Co., Pa.
22 Miles from Philadelphia, Pennsylvania

Put Your Idle Capacity to Work

Hundreds of metal-working companies are finding profitable business today outside their regular lines. Tell metal-working America—the 100,000 readers of American Machinist—about your facilities. Write for rates.
CONTRACT WORK DEPARTMENT
AMERICAN MACHINIST
330 W. 42nd St., N. Y. 18, N. Y.

GEAR BLANKS

WE CAN MAKE QUICK DELIVERY ON YOUR GEAR BLANKS

Send Us Your Prints for Quotation

PRECISION MOTORS COMPANY, 119-22 Park Place, Richmond Hill 19, N. Y.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

10 cents a word minimum charge $2.00. (See ¶ on Box Numbers.)

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS. 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

DISPLAYED—RATE PER INCH:

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A. M., February 4th will appear in the issue of February 17th subject to limitations of space available

WANTED ENGINEER

for plant engaged in manufacturing small precision machine parts. TO SOLICIT BUSINESS and ASSIST IN ENGINEERING JOBS. Must have a thorough knowledge of costs and complete familiarity with the function of all machine tools. The company is financially sound and is managed by progressive young men. Good post-war possibilities. When applying give age, period worked for last three employers, name of immediate supervisor, and salary expected. We will not correspond with your present employer unless you request it.

GENERAL MANUFACTURING CO.
4204 Lyndale Ave. North
MINNEAPOLIS 12 MINNESOTA

WANTED — TOOLMAKER

who has had enough experience to take charge of tool room on special machine tools, jigs, fixtures, and gages, for our own plant. Excellent post-war opportunity for man who desires to get connected with a progressive concern established in 1933. Factory located on beautiful Lake Shore Drive, in southwestern Michigan. Give all details and salary expected in first letter.

P-701, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED SUPERINTENDENT

for Turret Lathe Division, Warner & Swasey No. 4 or equal. Must know feeds and speeds. Man with ability who could eventually qualify as Factory Manager. Excellent Post War Prospects.

P-735, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

WANTED
DESIGN ENGINEER

Preferably a graduate electrical engineer with mechanical and electrical design experience and with demonstrated creative ability in the development of machine products. The position is with a long established, progressive organization and offers an opportunity for a permanent and unlimited future. This company is located at the gate-way to Wisconsin vacationland with excellent residential and educational facilities and congenial working conditions.

Please supply a full resume of education, experience, availability and recent photograph or snapshot.

P-755, AMERICAN MACHINIST
520 NORTH MICHIGAN AVENUE CHICAGO 11, ILL.

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

MECHANICAL DRAFTSMAN with practical mechanical experience in blanking, drawing and forming dies for sheet aluminum products in defense work by old established company in Central West; give experience and full particulars. P-667, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

TOOL MAKERS for defense plant in Central West; give experience and full particulars. P-668, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

3 FIRST CLASS MACHINE TOOL DESIGNERS wanted with experience on medium and heavy machine tool design. Company now working on War work. The work will however continue through Post War Period. Position can be considered permanent. Location Southern Ohio. P-737, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

POSITIONS VACANT

GOOD MECHANICAL ENGINEERS WANTED: One or two, preferably with experience in heavy machine tools. Good opportunity for advancement for capable men. Give experience, age and salary expected. P-736, American Machinist, 330 W. 42nd St., New York 18, N. Y.

A FIRST-CLASS CHIEF DRAFTSMAN who has held a similar position with a machine tool builder we have an opening for. Good opportunity for right man. Give age, salary expected and outline experience. This will be treated strictly confidential. P-746, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

CAPABLE MACHINIST WANTED: For permanent position in Research Organization. Must be able to handle all usual machine tools and do some gas and electric welding. Excellent working and living conditions. Located in small southern city. If interested, write Callaway Institute, Inc., LaGrange, Georgia.

CAPABLE DRAFTSMAN WANTED: For permanent position in Research Organization. Must be experienced in machine design and preparation of work drawings. Familiarity with patent drawings and machine shop practice desirable. Located in small southern city. If interested, write Callaway Institute, Inc., LaGrange, Georgia.

PRODUCTION AND SALES ENGINEER, to develop and head a Light Punch Press Products Business to be based upon a new, highly productive Punch Press. Must be a practical, resourceful production man with sales and executive ability. P-759, American Machinist, 330 W. 42nd St., New York 18, New York.

POSITIONS VACANT

SUPERINTENDENT of Modern Production Machine shop. Must be first class machine mechanic, know screw machine tooling, modern precision grinding methods, heat treating, precision inspection, have a dynamic personality with a successful background, and able to train and handle workmen. Interested only in man seeking permanent connection. Age preference—45 to 50 years. P-758, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MANUFACTURING EXECUTIVE. Under 50. Familiar with light steel fabrication and arc welding to take charge of all manufacturing and plant production. Old established company in Southern States employing 700. Good opportunity to eventually become vice president of firm. Give full age, experience reference. Salary expected. P-760, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MAN WANTED: With machine tool experience necessary. Must be draft deferred. State technical qualifications. Requires traveling. Essential industry. P-757, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MACHINE TOOL MAN WANTED familiar with office routine with full knowledge machine tools and tooling for permanent job with progressive machine tool manufacturer Metropolitan New York District. Give full details of experience and background. State salary. Replies held confidence. P-762, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Additional Position Vacant Advertisement on the following page)

Additional Employment Advertisements on the following page

(AVAILABLE)
SUPERINTENDENT

Equipped to handle precision tool and die shop up to 300 men. 16 years practical, 14 years supervision work. Location immaterial.

PW-763, AMERICAN MACHINIST
330 West 42nd Street, New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 34 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 266 Delaware Bldg., Buffalo, N. Y.

POSITIONS WANTED

ENGINEER-mechanical, graduate, 10 years experience, developing machine tools, hydraulic and special production machinery. $7,500 yearly; release obtainable. S. Frankel, 433 West 21st Street, New York City.

WORKS MANAGER or Superintendent. Practical and technical with business and industrial engineering experience; experienced in supervising tooling and production on small and medium interchangable parts. PW-761, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITIES
OFFERED—WANTED
Selling Agencies—Sales Executives
Salesmen—Additional Lines

WANTED

WANTED—additional lines of machine tools, gauges or allied shop equipment that can be sold to metal manufacturing plants. Only the products of progressive and reputable manufacturers will be considered on an exclusive agency basis. We can offer you complete sales and engineering service on your line. RA-748, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MANUFACTURING REPRESENTATIVE having wide experience and extensive following in Northern and Southern California, Arizona and Nevada, would like to montact machine tool and allied supply manufacturers desirous of obtaining specialized and energetic representation in this area. RA-751, American Machinist, 68 Post Street, San Francisco 14, Cal.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N. W., Washington, D. C.

SPECIAL SERVICE

MEXICO: EXPORT MANAGER visiting Mexico in March will execute special commission or make investigations. SS-753, American Machinist, 330 W. 42nd St., New York 18, N. Y.

CONTRACT WORK

WORK WANTED—For advertisement of work wanted see page 266.

WANTED

WANTED—Gang-Slitter, any size, to cut light-gauge metals. Apply W. 750, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ANYTHING within reason that is wanted in the industry served by American Machinist can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

WANTED
PLANT SUPERINTENDENT

Pacific Northwest Centrifugal and Turbine Pump Manufacturer, in business 20 years, is now making plans for current and postwar production. Needs a plant superintendent with the following qualifications:

1. Thorough knowledge of the machinist craft and of the equipment used by machinists
2. A minimum of five years experience involving supervision of a number of people
3. A background of experience in planning and organizing the daily work of men, machines and materials
4. Although experience in the pump industry desired, this is not requisite.
5. Ingenuity in development of fixtures and machine set-up to reduce manufacturing time to a minimum is of major importance.
6. Most important is ability to direct and lead men
7. Fundamental training in supervision such as given by Training-Within-Industry Division of War Manpower Commission, Job Instruction Training, Job Methods Training, Job Relations Training, Safety Engineering, National Foreman Institute, etc.

This company is willing to pay in proportion to the individual's ability to do this job. At present this company is considered 100% essential in War Production. This is an opportunity for the right individual to assure his postwar future.

Send history of experience and photograph to
P-764, AMERICAN MACHINIST
68 Post Street San Francisco 4, Calif.

WANTED: MANUFACTURERS' REPRESENTATIVE

A number of territories open to sell on commission basis outstanding Machine Tool Accessory line also a Flexible Coupling of exceptional merit. Write giving full details as to present connections and past experiences. All correspondence kept confidential.

RW-756, AMERICAN MACHINIST
330 West 42nd Street New York 18, N. Y.

WANTED

Salesman Wanted
MACHINE TOOLS

Detroit area. Real Post-war opportunity. Well established firm.

SW-754, AMERICAN MACHINIST,
330 West 42nd St., New York 18, N. Y.

WANTED
150-200 TON PRESS

Straight sided, mechanical, must have 20" stroke. Minimum shut height 19" bed to slide stroke down adjustment up. Adjustment of slide 5" minimum. Width between columns minimum 29". Bolster dimensions front to back minimum 27". Twin drive, double back geared. Speed, approximately ten strokes per minute.

JOHNSON BRONZE CO.
515 S. Mill St., New Castle, Pa.

SALES ENGINEER

with machine tool experience, preferably in screw machine line, by old line manufacturer.

ADDRESS—SW-717, American Machinist
520 No. Michigan Ave., Chicago 11, Ill.

SMALL TOOL MANUFACTURERS

Looking for real aggressive sales representation on West Coast, will benefit by writing RE-NU-EDGE, 1709 Colorado Blvd., Zone 41, Los Angeles, Calif. Branches in San Francisco, San Diego and Seattle.

WANTED

Rotary Surface Grinders, Heald or Arter, 8" to 12" magnetic chuck. State condition, serial number and price delivered f.o.b. New York.

J. H. H. VOSS CO.
785 East 144th St., New York 54, N. Y.

WANTED — YOUR PRODUCTS

Sales Engineer will represent you in Mo. Want lines of Cutting and Machine Tools. Also sub-contracting. AM. M. E. and will handle jig and fixture work. Qualified to give tenchnical service. Write

T. F. MURPHY
7500 EUNICE AVENUE, ST. LOUIS 20, MO.

NEW INVENTIONS WANTED

Mechanical and electrical devices for post-war manufacture and sale. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

WANTED
New York and Export Agency
For Line of High Grade Machine Tools
Also Some Small Tools
H. W. COTTON
475 FIFTH AVE., NEW YORK 17, N. Y.

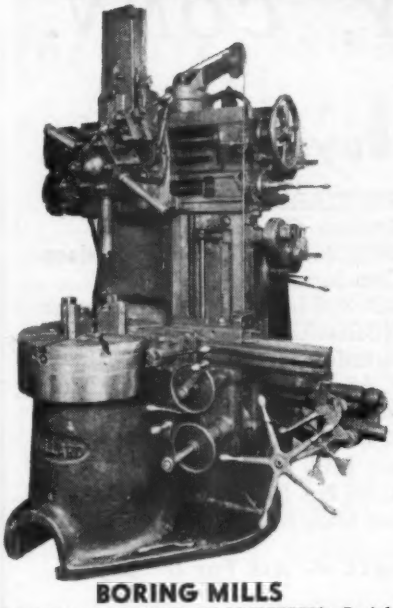
NEW INVENTIONS WANTED

Seeking small or medium size devices, preferably items for post-war consumer trade. Patents purchased outright or on royalty basis.

CLARK MACHINE CO.
Brant Avenue, Clark (Rahway) N. J.

IMMEDIATE DELIVERY

"FALK" for DEPENDABILITY in Rebuilt Machinery



BORING MILLS

24" BULLARD RAPID PRODUCTION: Serial 6620—Vertical Turret Lathe with Side Head, Motor Driven, 3-60-220. Complete. Reconditioned—Immediate Delivery.

3½" Bar, Landis, Floor Type; Floor Plate 120"x72"; Range—60" Longitudinal Travel, 60" Vertical Travel, 26" Spindle Travel at one Setting.

MILLING MACHINES

No. 3 Cincinnati Vertical High Power Miller, Motor Driven; Power Rapid Traverse, Serial A 308-E; Range 34" Longitudinal Travel, 12" Transverse, 20" Vertical; Thoroughly reconditioned; immediate delivery.

AMES Precision Universal Bench Mill.

No. 1½ Brown and Sharpe Universal Mill, Motorized

No. 1 Kempsmith Universal Mill

No. 4 Cincinnati high power plain Miller, single pulley drive

No. 14 Cochrane-Bly Vertical Duplex Miller-Shaper: Single Pulley arranged for mtr. dr.

No. 1 Cleveland Vertical Miller.

No. 2 Pratt & Whitney Duplex Production Miller, Belt drive and countershaft.

No. 1 U. S. Hand Miller, motor driven.

No. 12 Pratt & Whitney Profiler.

No. 1½ Valley City Plain Miller, belt drive.

PRATT & WHITNEY 2" Spline Duplex Miller

1—No. 4 Cincinnati Plain Miller, high power, Serial #A-703-D.

HEAVY PRODUCTION FOLDER NIAGARA #98

6' x 14 gauge capacity. Ar. M.D.

Working length 72", cap. 14 gauge; min. width of fold at cap. 1" gaging range (narrow folds) 3/8" to 1 5/8", max. gaging range 72" left of chamfering bar 3". Shipping wt. 12,690 lbs. Like new.

HAMMERS

High Speed Riveting Hammers, all sizes in stock from 6 A to AA 1.

1100 lb. Niles Steam Forging Hammer.

50 lb. Fairbanks Blacksmith Forging.

15 lb. Bradley upright strap Hammer.

GRINDERS

#2 Cincinnati Centerless Grinder, Serial #H, 2055-Y.

24" x 136" Landis Universal Cylindrical Grinder, motor drive, perfect condition, rare bargain.

Pratt & Whitney 14" x 36" Vertical Surface Grinder, ball bearing spindles, belted motor drive, 10" x 36" magnetic chuck.

No. 2 and No. 3 Brown & Sharpe Cutter Grinder.

#2 Brown & Sharpe Universal Cylindrical, belt drive.

18" Gordon Disc Grinder, double end, B.D.

12" x 2" New B-line Floor Grinders, 3 H.P., 3-60-220/440.

24" Landis Universal Cylindrical Grinder (as illustrated foot of next column).

GEAR CUTTING MACHINERY

No. 13 Brown & Sharpe Spur & Bevel Gear Cutter.

No. 612 Fellows Gear Shapers, large hole in spindle. Exceptionally fine condition.

PLANERS

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Cincinnati 24" x 24" x 6' table, belt drive, single graduated swivel head on cross rail.

American, 30" x 30" x 12', A.C. Motor Drive, two heads.

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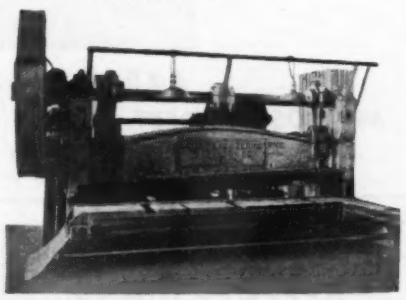

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Rockford 16 x 6 Quick Change Gear, motorized.

LeBlond 14" x 6' Toolroom Quick Change Gear Screw Cutting Lathe with taper attachment, drawbar collets and two chucks.

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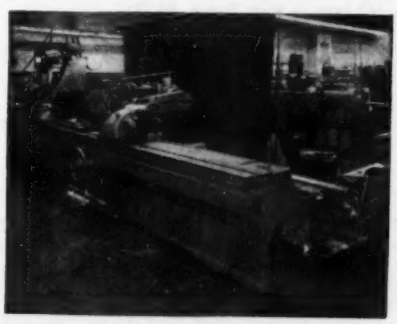

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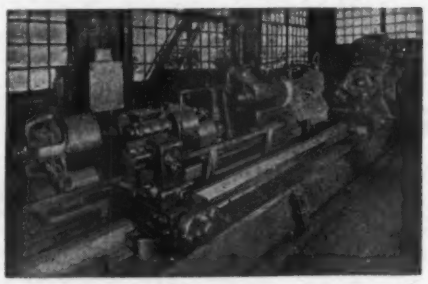

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#3-B MILWAUKEE Plain Miller
#2 CLEVELAND Plain Miller
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12" Wm. SELLERS Slotters
20" SELLERS Crank Slotter, M.D.
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No. 4 Cincinnati Plain, round overarm
No. 4B Milwaukee Plain, m.d.
No. 4 Cincinnati Universal, cone
No. 5B Heavy Brown & Sharpe Plain, m.d.
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No. 5 Jackson Vertical, m.d.
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Newton Keyseat, m.d.
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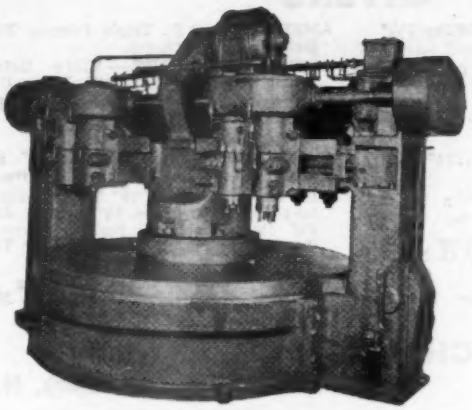

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Horizontal adjustment of each head on rail 19".
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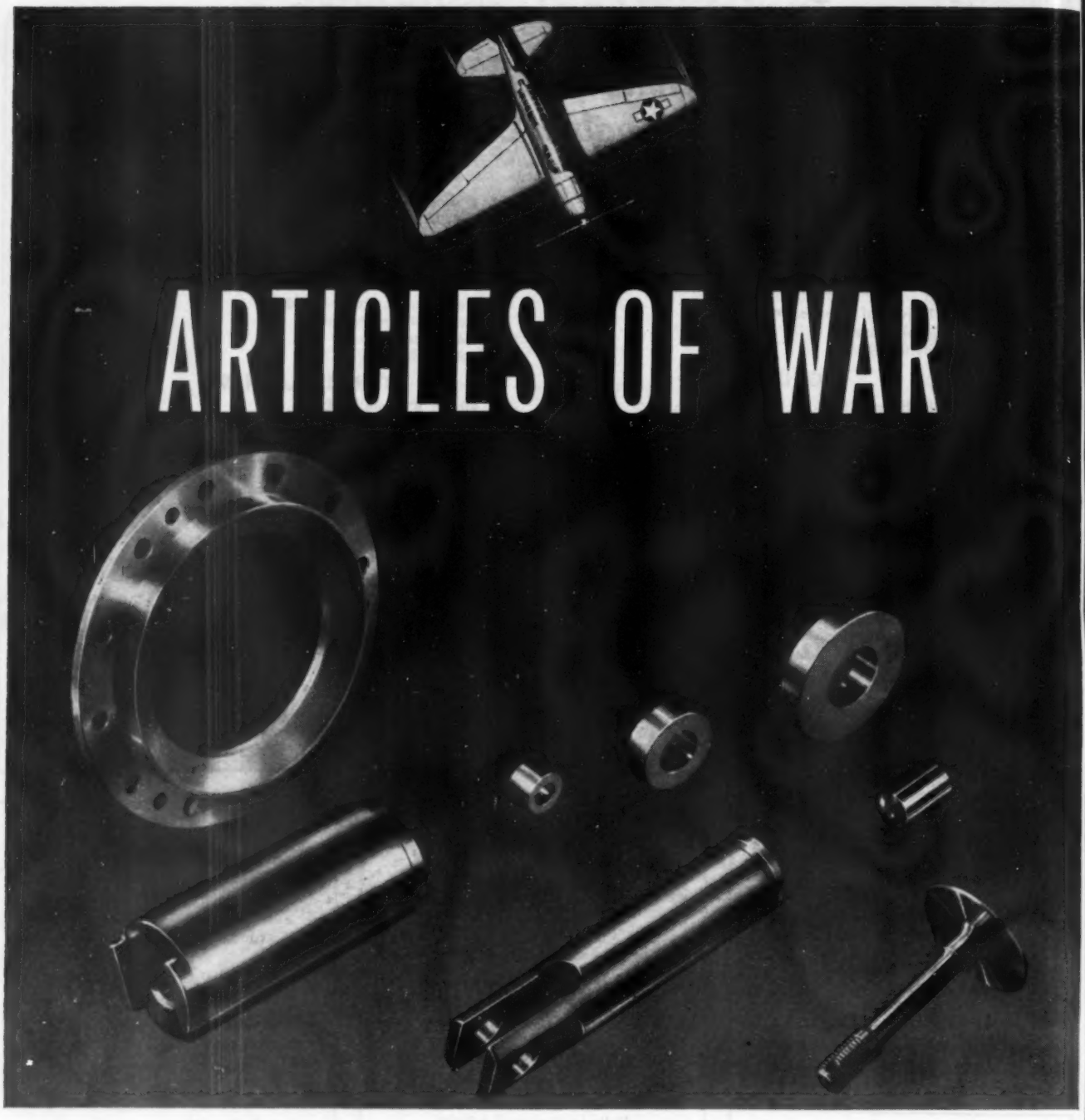

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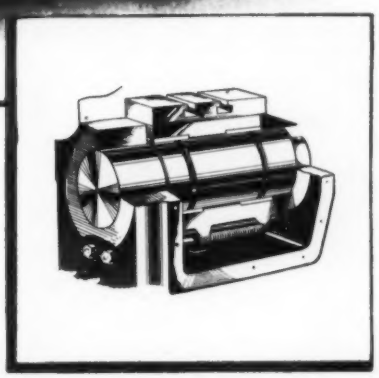
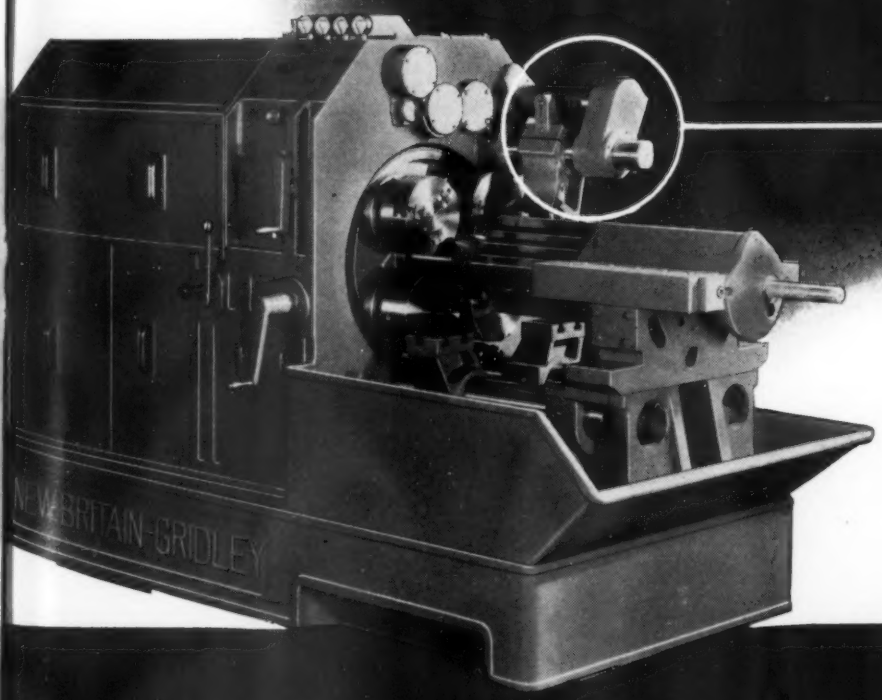
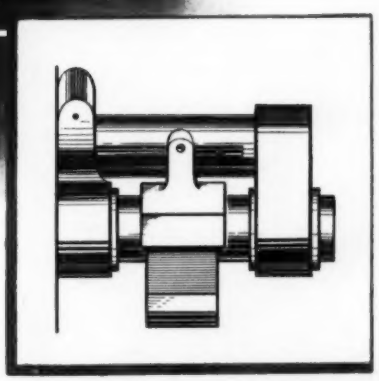


Completely enclosed cross slide (cutaway view) of a New Britain Automatic Screw Machine.





Swinging-type forming arm of a New Britain Automatic Chucking Machine.

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FROM MESS KITS FORMED BY GRAPH-MO STEEL DIES

These dies have smashed out 400,000 stainless steel mess kits for the armed forces, without being removed from the press.

Besides actively demonstrating Graph-Mo's ability to stand up, this job also provides further evidence of its non-deforming qualities. To accomplish the tough assignment of drawing and trimming stainless steel, the punch and die must be held to close tolerances. After heat treating, dies made from Graph-Mo had only to be touched up with a stone. Similar dies made from competing steel showed distortion of .003″-.005″.

Graph-Mo is an oil hardening steel recommended for tools, dies, oil seals. wear plates, spindles, gages, etc. It offers good resistance to abrasion and has excellent machining properties.

Use Graph-Mo today to speed Victory - - Use it tomorrow for increased production and greater profits. Steel and Tube Division. The Timken Roller Bearing Company, Canton 6, Ohio.